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[Special Editorial Correspondence, by Telegraph.]

TWENTY-EIGHTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

AUDITORIUM HOTEL, CHICAGO, ILLS.,
Wednesday, May 17th, 1905.

Dear JOURNAL: The first day's session of the 28th annual meeting of the Western Gas Association was adjourned at 5:30 P.M., and if strict regard to business, without pyrotechnical display, goes for making a verdict, the latter must be in line with the writing that the Western as it grows older grows stronger. The headquarters in this huge hostelry, the housing of the guests and the care thereof, the meeting room, in fact, all such details, were without flaw, and the local committee, under the direct charge of Chairman Eustace, came in for many encomiums. Their preliminary work and their constant attention to the comfort and aid of the members and their guests were well appreciated, and the thought of trouble or vexation to any in attendance at the meeting, on account of the "striking" action of many of Chicago's working men, was at once put at rest. In fact, John Williamson asserted that, as far as the Association was concerned, the "strike" afforded the members an opportunity to stick closer together. When President O. O. Thwing, of St. Louis, called the meeting to order at 10:15 this morning, he had the satisfaction of addressing a representative assemblage of Western gas men. Secretary Dunbar was there too; quite a busy man at his document covered desk. Without much ado, the President introduced Mr. H. S. Taylor, Chicago's Prosecuting Attorney, who, in the absence of Mayor Dunn, welcomed the Association, promising the members all sorts of privileges during their stay in the Windy City. His welcome met with a neat and witty response from Col. Ira C. Copley, who in his Aurora home seems to be training for some political trial that will attract the attention of the State. A lot of routine work was gone through within short time—Mr. Thwing certainly has every requisite necessary for a successful presiding officer. This concluded, Vice-President Doty took the Chair while the President read his annual address. It is an able message, and its lines go to show that Mr. Thwing can originate as well as deduce. He was heartily applauded during its reading and at its close. The address having been referred to a committee for consideration and report, the report of the Board of Directors, including the recommendation for the establishing of a fund of $500 ($100 annually) to go to the Educational Committee of the American Gas Light Association, was concurred in. The Chairman of the Committee on Applications for Membership (Mr. Wm. McDonald) reported 109 names—74 active and 35 associate—which goes to show that the Western is still ready and capable of transacting active business on its own account. The election to membership having been satisfactorily disposed of, and those of the "new ones" present having been fraternally introduced by the "best of all," Uncle "Jerry" Howard, who, by-the-way, is spryer than ever, the paper list was taken up. The first number was that by Mr. Jacob D. von Maur, of St Louis, whose thoughts and opinions on "Cement Joints" brought out a good discussion, a feature of which was a written communication forwarded by Mr. Ralph Woodward, of Pittsfield, Mass. Owing to the absence of Mr. F. C. Sherman, of New Haven, Conn., his interesting paper on the "Use of Tar Fuel in Bench Firing" was read by Secretary Dunbar, and when the discussion thereon was concluded, an adjournment to 2 P.M. was ordered. The afternoon session was opened by the presentation of the "Wrinkle Department," edited by Mr. W. A. Baehr, of St. Louis. The collection (it was read by title only) certainly did credit to Editor Baehr and to those who heeded his appeals for "matter," and Editor and contributers had the satisfaction of knowing that their efforts provoked a rousing discussion. Next came the paper by Mr. Irvin Butterworth, of Grand Rapids, Mich., whose thoughts on "The Prevention of Stoppages in Services, Meters and House Pipes in Cold Weather," were in the author's usual lucid, calm and conservative manner. Mr. J. B. Moorehead, of Chicago, followed with his remarks on "Acetylene." He certainly is to be congratulated on the way in which he handled his theme. The paper by Mr. B. E. Chollar, of Kansas City, Mo. (it was read by Mr. W. E. Steinwedell) on "The Evolution of the Engineer," was in that gentleman's characteristic vein, and it caused a debate that was marked by considerable divergence in opinion. This brought the day's technical sessions to a close. The weather conditions are of the musty, hazy sort, but no one seems to mind the dampness. Reports from all sides go to show that business indications, so far as the Western gas man is concerned, are "all to the good," despite some manifestations of freakiness on the part of local authorities. The meeting lacks nothing from any point of view that a gas man might or could desire.—S.

CHICAGO, May 18th 1905.

Dear JOURNAL: The second day's sessions were commenced at 10:30 A.M. A supplemental report from the Board of Directors was the first thing in hand. On motion of Vice-President Doty it was voted that Frederick E. Turneare, Dean of Engineering, University of Wisconsin, and Chas. F. Burgess, Professor College Engineering, of the same Institution, be transferred from associate to active membership. The first paper to-day was that by Mr. K. M. Mitchell, of St. Joseph, Mo., who told the story of "Kansas Oil" in good style. It was followed by the paper on "Texas Oil," told vividly by Mr. Thomas D. Miller, of New Orleans. The joint discussion on these kindred topics was a good one. The formal roll call was then taken up. On motion of Mr. Butterworth it was determined that hereafter the roll call will be in accordance with the card system, and that means of providing for the "identification" of members be determined upon. This task was voted to the custody of Mr. Butterworth. Next followed the paper by Mr. Fred B. Wheeler, of Detroit, Mich., who presented his views on "The Practical Enrichment of Low Candle Power Coal Gas with Benzol." The debonair "Fred" does not show any sign that his flitting from Binghamton, N. Y., to Detroit, has disturbed him in the least. The next place of meeting is Cleveland, O., and the rolls were further increased by the placing thereon of the names of 10 actives and 7 associates. The session was adjourned at 12:30. The weather conditions so far to-day could not be excelled, which benefaction is gladly welcomed by the local committee, who have much to do just now with entertaining the women folks. No action was taken on the Ohio Gas Light Association's proposition for a joint meeting place next year. The afternoon session was convened at 2:30, and the first matter considered was the report of the Library Committee. The report showed that the importance of this part of the Association's work was appealing to the members more and more as time goes on. Then followed the report of the Committee on Publication, which Committee was ordered continued. The paper by Mr. W. B. Calkins, of Fairmont, Va, on "Coal Sampling and Testing," was read by title only, after which came the report from the Memorial Committee, which was presented by Mr. Paul Doty. The list of honored dead was an appalling one, but the tributes paid to their memories, both in set committee phrase and in oral manner, showed that the work of those who had gone beyond was appreciated, and that their loved personalities would long live in the hearts of those who still were active in life's labors. The paper by Mr. N. D. Cochran, of Toledo, O., on "The Ideal Corporation," was next considered. The election for officers resulted as follows:

President—Mr. Paul Doty, St. Paul, Minn.
First Vice-President—Mr. K. M. Mitchell, St. Joseph, Mo.
Second Vice-President—Mr. W. A. Baehr, St. Louis, Mo.
Secretary and Treasurer—Mr. Jas. W. Dunbar, New Albany, Ind.
Directors (to serve 2 years)—Messrs. J. H. Eustace, F. B. Wheeler, C. H. Dickey, Geo. S. Clarke, Kansas City, Mo.
Director (to serve 1 year)—E. E. Witherby, New York city.
Editor Wrinkle Department—Mr. Bryce McAdam, Milwaukee, Wis.

Some appropriate responses from the officers-elect closed the day's session, and an adjournment was ordered until 10 A.M. to-morrow. The luncheon given in honor of the fair sex this afternoon was a "charming success" as one of the sharers therein declared. The theater entertainment for this evening cannot fail to be "a go." We are getting ready for the dinner and vaudeville show at the Chicago Athletic Club, and the Eustace-Williamson supervising combination say the entertainment will be a record breaker.—S.

CHICAGO, Friday, May 19th.

Dear JOURNAL: It is the morning after the banquet and show. Both were of primest sort. No Rejanes and nothing to hide. The attendance was great, the food was good, the entertainment was galore. Perhaps some of those who were present will tell you la er on about the details. At time of writing (9 A.M.) the technicians are assembling for the final session, when the respective papers by Messrs. F. H. Shelton, George C. Hicks and Sir O. N. Guldlin will be considered. Knowing your going-to-press hour, I send this along, in the hope that it will be in time for printing. Let the federation plan belong to time for developing, but take it as a fact that the Western Gas Association is up to not only keeping its position but advancing it, as the records of this meeting will amply show.—S.

BRIEFLY TOLD.

DEATH OF MR. HENRY W. MILLAR.—With exceeding regret we report the death of Mr. Henry W. Millar, the well-known President of the Charles Millar & Son Co., of Utica, N. Y. He died in Chicago, Ills., the afternoon of the 10th inst., which city he had visited for the purpose of being treated for heart trouble at the hands of a well-known specialist. Mr. Millar, who was in his 66th year, had for many years been prominent in the commercial, social and political life of Central New York.

[Report of Proceedings.—Continued from page 770.]

TWENTY-FIRST ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

HELD AT PITTSBURGH, PA., MARCH 15, 16 AND 17, 1905.

SECOND DAY—AFTERNOON SESSION.

[Report of Committee on Fuel Economics—Concluded from Page 770.]

Prof. Richter, of the University of Wisconsin, conducted some careful tests at Cornell College, in connection with Prof. Thurston, to determine the heat conductivity of certain metals under different conditions of thickness of metal, differential temperature and rapidity of circulation. From these, and from data obtained from Mr. Abell, it may be stated authoritatively that, in the case of transmitting heat from steam on one side of the walls to water on the other side, the amount of heat which will be transmitted per square foot of heating surface per degree difference in temperature per hour, will vary from 2 B.T.U.'s to 2.4 B.T U.'s, depending upon the rapidity with which the circulation of the fluids is maintained. A counter arrangement, where the incoming hot steam comes in contact with the walls holding the outgoing hot water and the outgoing cooler steam comes in contact with the walls holding the incoming cold water, gives the greatest range of effective working, and produces the best thermal results. In any water heater particular care should be given the facilities for cleaning and removing any foreign matter which may be thrown down by the water, and for this reason the water is usually carried inside of tubes which are surrounded by the steam, as the interiors of tubes lend themeselves to easier cleaning as compared with the outside.

A very thin coating of any foreign substance such as lime, magnesia or grease, will materially affect the capacity of a heater to do work, often cutting the efficiency from 50 to 75 per cent., if not properly watched. Feed water heaters are subjected to sudden changes in temperature, and should be so constructed that the strains which are set up by these changes can be taken care of and not produce leakage.

Open heaters, where the exhaust comes in direct contact with the water, are of comparatively high thermal efficiency, as the water and steam come into intimate contact, but difficulty is experienced in that the cylinder oil which comes over with the steam will find its way back into the boiler, not only causing a great decrease in efficiency of the boiler, by forming a coating of poor heat-conducting material on the inner surface of the boiler, but often causing severe damage by the burning of the sheets or tubes by preventing the dissipation of the heat given up by the flue gases.

If the auxiliaries are driven by means of gas engines instead of steam engines, the feed water heater may be made just as available, and if plenty of hot boiler water is available the water heated by means of the gas engine exhaust may be made use of to heat the buildings or gas storage tanks, but the gas engine feed water heater has an advantage over the steam heater in that the heat delivered by a gas engine is of much higher potentiality than that delivered by a steam engine.

At the end of expansion in the gas engine cylinder, under ordinary working conditions, there is an exhaust temperature of something like 1,600° F., but this drops very rapidly, both due to the sudden expansion of the gas and the absorption of heat by the jacket water, but the temperature is still up in the neighborhood of 1,000° F., while the temperature of the steam exhausting at 2-gauge back pressure is but 218° F., so in the gas engine the available heat is what may be called high potential heat, and where engines of large capacity are in use, feed water may be heated to a high temperature, or steam of high pressure can be generated, as a large amount of heat will be available at a temperature where a large per cent. can be utilized.

In designing a heater for taking up the heat of the exhaust and adding it to the heat already put into the water, which water has passed around the cooling jackets, a different value must be taken than in the case where the heat was to be transmitted from steam to water. In this case the surface may be relied upon to transmit from 2.15 to 3.15 B.T.U.'s per square foot of heating surface per degree of difference of temperature per hour. The same value may assigned to a heater when advantage is taken of the sensible heat which escapes from the products of combustion of a water gas machine during the blow, or from the burning of the CO to CO_2 when this is not made complete in the generator, as in each case the transference of heat is between water on one side and gas on the other.

In case all the feed water required has been furnished hot, and the heating of the buildings attended to, it may be well to look into the question of what may be accomplished along the line of preheating the

air which is to supply the oxygen to the furnaces, an example of which is had in daily practice in bench work in the preheating of the air, sometimes both in the furnace and in the secondary combustion chamber, and sometimes in the secondary combustion chamber only.

In a boiler where the combustion is supposed to be complete in the furnace, and the heat transmitted to the water is that of the radiant energy of the fuel bed, plus the sensible heat of the off-going products of combustion, a limit is easily reached, beyond which it is impossible to go without making some arrangements to take care of the excessively high temperature produced in the furnace on the grate bars which would cause the ashes to slag and form clinkers, and so make the furnace inoperative by closing up the openings in the grate bars and preventing the air from passing through. This may be accomplished by introducing some compounded gas with the air which will be broken up in passing the grates, absorbing heat by the chemical decomposition, and by absorption keep the temperature of the grate bars down below the fluxing point of the ash. Both steam and products of combustion containing CO_2 are made use of to accomplish this result, the latter being preferable, due to the high heat of vaporization of the steam, large quantities of which may be condensed by striking the cold surface of the boiler later taking up heat, and robbing the boiler of some of the heat which might be used in useful work of heating the water; while the CO_2 gas will be broken up on striking the high temperature at the grates, burn later to CO_2 as the secondary air comes in contact with it and pass off completely burned, the only loss being that of the sensible heat of the additional nitrogen which has come in with it and absorbed sensible heat by being raised to the same temperature as the rest of the products of combustion issuing from the boiler.

Flue Gas Analysis.

A Guide to Furnace Handling.—Probably nowhere can a little knowledge of chemistry be made use of to a better advantage than it can be in an endeavor to obtain proper combustion of fuels. The apparatus necessary for doing this work is so inexpensive and its operation so simple that no works can afford to operate without its use. Large amounts of money are invested to obtain the highest efficiency types of apparatus in the way of furnaces, economizers and recuperators, and after the installations are made too often no attention is ever given to find out what results are being obtained, and many of the so-called economizers on the market depend to a very large extent upon utilizing the needless and careless waste in fuel going on in the furnaces, and which can just as well, and better, be saved in the setting as in an expensive addition to it, for there is bound to be economy in the centralization of the process. In order to determine just what results are being obtained in furnace practice, some simple testing apparatus, such as an Orsat, is best adapted to the work.

In the operation of an Orsat apparatus, advantage is taken of the fact that there are certain chemical solutions which will absorb certain gases and will not absorb other gases, and the Orsat apparatus is a collection of 3 or 4 pipettes containing these several solutions, arranged so that a large area is presented for the solution and the gas to come in contact. A certain quantity of the furnace gas, usually 100 cubic centimeters, is measured before starting the test and measured again after each constituent is absorbed by the chemicals, the amount absorbed in each case being the quantity of the particular constituent present. If the test is started with 100 C. C. the apparatuses read direct in per cent. of the gases absorbed.

With this apparatus, the amount of carbon dioxide of free oxygen and of carbon monoxide can be determined in a few minutes, showing whether too much or too little air is being admitted at any particular part of the furnaces. This entire apparatus, ready to operate, will not cost more than $40, which will easily be repaid in a short time.

A complete description of how to handle this apparatus can be found in Mr. Baehr's paper, read before the Ohio Gas Light Association, March, 1903.

Equally important with the question of properly handling the fuel in a properly selected furnace is the question of a judicious selection of the fuel itself. Along with the waste encountered in imperfect combustion should be considered the losses oftentimes allowed to go in the fuel itself.

The Use of Coke Breeze as Bench and Boiler Fuel.—All gas house coke delivered to the yard produces from 10 to 15 per cent. of breeze after it has been crushed, screened and handled ready for the market, and the breeze contains from 75 to 80 per cent. of carbon, or allowing 1,200 pounds of coke per ton of coal carbonized from every ton of Youghiogheny coal gasified (having a calorific value of 13,000 B.T.U.'s per pound) there is available from the breeze between 652 and 1,040 B.T.U.'s or from 5 to 8 per cent. of the original heating value of the pound of fuel. Two methods are in use for using the coke breeze as fuel; the first, in which underfeed mechanical stokers are used; the second, where forced or induced draft is used with some special form of grate bar especially designed for this particular fuel.

A complete description of an equipment using underfeed stokers is reported on by Mr. M. E. Malone, in a paper read before the Ohio Gas Light Association (1904), showing the arrangement made use of in the Denver plant. A number of carefully made tests are recorded in the report giving the results where breeze only was used as fuel, others showing the results obtained by mixing the breeze with steam coal. The following is a summary of the best results obtained where breeze only was burned:

Water evaporated from and at 212° F. per pound breeze. .	6.34 pounds.
Water evaporated from and at 212° F. per pound combustible	8 37 "
Water evaporated per square foot of heating surface per hour	2.16 "
Fuel burned per square foot grate surface per hour	24.8 "
Carbon dioxide in escaping flue gases	3 4 to 7.2 per cent.
Oxygen in escaping flue gases	14.7 to 16.6 "
Per cent. carbon monoxide in escaping flue gases	None.

Refuse ran about 23 per cent. of the breeze; temperature in stack, 550° F.; calorific value of breeze by calorimeter, 10,658 B.T.U.; calorific value of combustible by calorimeter, 13,045 B.T.U.

Similar tests were conducted at the plant of the Madison (Wis.) Gas and Electric Company, a report of which in detail appears in the Proceedings, Ohio Gas Light Association (1904), by the writer. The result of the two sets of tests as reported correspond in general in the economic working of the boiler. The boiler on which the test was conducted at Madison, was equipped with a special, hollow-blast grate designed especially for burning breeze, the blast being supplied by a motor-driven blower. An experiment was made to determine the amount of moisture contained in the breeze, the sample of breeze being taken from a supply which has been under cover for 6 months.

The sample was subjected to a temperature of 170° F. for 150 hours, at the end of which time no further loss in weight from evaporation was evident. The sample decreased 15 per cent. in weight, due to the contained moisture being driven off.

Lampblack as Boiler Fuel.—The use of lampblack as boiler fuel is common among oil gas plants. A very excellent oil coke is made out of lampblack which contains 98.8 per cent. fixed carbon. Lampblack, being carbon in a very finely divided state, needs only some binding material to take the particles and hold them together so that they will be retained in a commercially convenient form.

The coke made is ideal—it is devoid of all volatile matter; but as it is taken from the retorts it contains enough tarry matter to properly bind and coke it, so that in even a coal gas retort there is enough heat to fuse the material into a perfect coke sufficiently hard to use for metallurgical purposes.

This fuel is also particularly adapted to use in an open grate, and the manufacturers of it are pushing it on the market as a fancy domestic fuel. One of its valuable characteristics is the small amount of ash. One hundred pounds burned in an open grate, where it kindles very readily and glows until it is consumed away, give not more than 1½ pounds ash.

The reason for this different action of lampblack coke from gas coal coke is that with the latter, as the carbon is consumed by contact with the oxygen of the air, the fuel becomes coated with ash, and the oxygen then has greater difficulty in reaching the carbon, while with the former hot carbon always presents itself to the oxygen until the fuel is entirely consumed.

Mr. E. C. Jones, in the Proceedings of the Pacific Coast Gas Association (1904), reports that a system of ovens under construction at Oakland, Cal., will soon be in operation where coke from lampblack will be made on a large scale.

When lampblack coke was first used for boiler fuel some difficulty was encountered in the burning down of the cast iron bars, but wrought iron bars have obviated the difficulty. All the boilers using lampblack coke are giving excellent satisfaction.

The Net Price of Coal.—Along the line of "A penny saved is a penny earned" in fuel economics, we are interested in getting rid of all the coke which is not used in the manufacture of gas. Let any gas company figure for themselves the sales per capita in their town, of any "popular" patent medicine, and again let them figure the sales per capita of fuel, other than coke, sold by their local coal dealers, and then ask themselves why they are selling their coke at the ridiculously low

prices they are getting, when they have proof positive from the patent medicine man that a little push will make the public buy something that it does not even want, when their own customers are buying every year several times as much fuel as the gas company has to sell and paying comparatively exorbitant prices for the other fuel? It may take a great deal of figuring and calculating to cut the net price of the gas 5 cents per 1,000 by trying to reduce the cost of the process of manufacture, while a comparatively small amount of energy will create a market for all the coke at an advance sufficient to give a net cut of 50 cents a ton on all coal purchased, and will mean the same 5 cents per 1,000 saved on the balance sheet.

Leaving the furnace, the auxiliaries and piping should next logically be given attention.

Steam Pipe Covering.—Practical users of steam and engineers can see great advantages derived from properly insulating steam pipes and other heated surfaces. When steam is conveyed long distances, in bare and exposed pipes, it condenses to a marked extent, and this condensation can be almost entirely prevented by the use of proper insulating material. Experience has repeatedly demonstrated that the use of an efficient covering will save the cost of this covering in coal expenses within a year, and in many instances it has been shown to have paid for itself in 3 or 4 months, for not only does the covering materially lessen the coal bill but it adds to the capacity of the steam pipe. It prolongs the life of valves and the service of all the apparatus through which the steam passes, and it reduces the temperature of the rooms and space through which the pipes are carried.

An eminent authority states that the best insulating substance known is air confined in minute particles or cells, so that heat cannot be removed by convection. No covering can surpass or equal that of perfectly still and stagnant air, and the value of most heat insulating substances depends upon the power of holding the minute quantities in such a manner that circulation cannot take place. Most gas works have more or less underground steam pipe which must not be overlooked. All these pipes should be carefully boxed, and the boxes filled with some efficient heat insulating material. In some cases charcoal is used, sometimes ashes, and again a more expensive material.

Oil gas plants making lampblack can afford to use some of this by-product for the prevention of the radiation of heat, for according to experiment by Prof. Ordway (Trans. Am. Soc. Mech. Engineers), lampblack is a very good non-conductor of heat.

Prof. Ordway's experiments consisted partially of determining the number of pounds of water at 70° F. that could be heated 10° F. per hour through various substances 1 inch thick, the heat applied being at 310° F. The following is an extract from his list of tests:

Insulating Material.	Relative Heat Conductivity.
Live geese feathers	9.6
Loose wool	8.1
Light carbonate of magnesia	13.7
Asbestos paper (wound tight)	21.9
Loose calcined magnesia	12.4
Cork charcoal	11.9
Loose lampblack	9.8
Pine charcoal	13.9

From this it is seen that in lampblack we have a very good material filling boxes covering steam pipes, as it ranks third in the order of best insulators. As a matter of fact it ranks first, practically, on account of the low ignition point of the first two insulators.

To facilitate distribution work gas plants are usually found located on low lands, and it is not an infrequent thing to hear of the gas plant being partially submerged during wet seasons. Under such circumstances it is almost imperative to run all of the steam pipes overhead, for a steam pipe in moist ground acts as a water heater from which no return can be realized. Again, pipes which are run beneath the floor line are more than apt to be allowed to get into poor repair; they are out of sight and will probably remain so until trouble of a serious nature arises to necessitate their repair, and meanwhile a tremendous amount of energy may be wasted and dissipated in heat through the soil from radiation and conduction, as well as from the aggregate of small leaks which may form without being detected, unless stringent inspections are made.

Methods of Driving Different Gas Works Auxiliaries.—It is well to consider the method for driving the several auxiliaries which are employed about a gas works, as there seems to be no definitely accepted standard. The auxiliaries usually to be considered are:

Exhausters, 24-hour service; blowers, intermittently, for 24-hour service; mechanical scrubbers, 24-hour service; hoisting and conveying machinery, 24-hour service; pumps for water, tar, ammonia, etc.; steam boilers for heating holders during cold weather and supplying steam in water gas outfits.

The sources of power that would naturally be considered would be reciprocating engines, either steam or gas, electric motors, steam turbines and compressed air. It is evidently impossible in any case to avoid the use of a steam boiler, as even with gas engines the waste of heat from the jackets and exhaust will not be of sufficient quantity for heating during cold weather.

In this country it has been a common practice to design exhausters and scrubbers in direct-driven units, as has been done in England, where they have been found entirely practicable. The former run at a constant speed, the slighest control in pressure being secured by throttling, and the latter naturally operate at constant speed. The conveying machinery being continuously in motion can readily be driven by gas engines. The pumps being of small size can best be operated by steam from the boiler, unless the additional investment of a special combination unit driven by a gas engine should prove advisable.

During the summer months gas works' boilers are usually run very inefficiently, and an electric motor, therefore suggests itself, either for reserve during the summer months or for operating pumps during the entire year. In any event, the size of the boiler for pumping and heating would be very much smaller than that for driving all the auxiliaries.

Owing to the fact that the heat of the exhaust steam can be readily reclaimed from steam engines, they may be used to good advantage in water gas plants, as the boiler is a necessity in any case. They could thus take the place of the gas engine in every point. In coal gas plants, however, where steam is not required, the large waste due to the exhaust of steam engines in the summer months becomes an important item, and the gas engine has first choice.

The electric motor, particularly the direct current type, is generally barred out on account of the possibility of explosions from sparking on the commutator, or the loosening of contacts, and the higher first cost of the apparatus. Besides this, the maintainance cost frequently amounts to a considerable sum, due to the decomposition of the insulating material used on the motor windings, which decomposition is brought about by the effect of the action of the gases about a gas works.

The first objection could be overcome to some extent by the use of the A. C. motor, housed outside of the buildings. This, however, introduces a somewhat clumsy construction. The second objection could be overcome by installing a small steam-electric plant in connection with the works, but for moderate sized plants this would be an inefficient method. The trouble with the failure of the insulation is a serious one in some plants, and no means have been found to prevent its occurrence. About the only place in which a steam turbine would be of any value is in the last mentioned case of the small auxiliary generating plant, but in this case the low efficiency of the smaller boiler plant must be taken into consideration, as well as the general complication which arises from an increased number of transformations of power. Compressed air is quite out of the question as motive power, owing to its inefficiency and the necessity for a prime source of power for compression, which, in turn would have to be driven either by steam, electricity or gas engine, which would introduce another undesirable link in the chain. Summing up the different advantages, the following might be in the order of merit:

Gas Engines.—All direct-driven auxiliaries, except steam driven pumps, with gas engine or motor driven relay for summer, if the decrease in the operating expense would warrant the increased investment. The exhaust and the jacket heat to be reclaimed for heating the feed water and heating the holder tank.

Steam Engines.—Direct-driven auxiliaries, making use of the exhaust steam for heating the feed water, and for heating holder tanks.

Motor Driven Auxiliaries.—Motors separately housed—taking current from city system.

Steam Turbines.—Auxiliary power plant, with motor-driven auxiliaries.

Conclusions.

In conclusion the writer wishes to recall to your attention a statement made in the early part of the paper, and to dwell on its importance, that the vital factor in securing fuel economies, by whatever method employed, lies in the comprehension of the man who does the work and in his desire to bring about good results.

Discussion.

The President—This very complete and comprehensive report is now open for discussion.

Mr. R. C. Congdon—I think what the writer said in regard to the comprehension of the man who does the work and his desire to bring about good results is a very important point. I think much can be accomplished in fuel economies by a systematic campaign of education. I recently had a very interesting experience in a water gas plant where they had for some time been employing more or less colored help. Taking hold of that plant I found it absolutely impossible to get these men to reason cause and effect, and it was very difficult at all to get any improvement whatever in results. Finally I put in 4 white men, who had never seen a water gas machine before, and started in to educate them. I explained what I knew myself, guarding against the point suggested by the writer of the paper about forcing too much on them at one time, and the result has been very gratifying. I have also made it a point to let the men know the results they were getting and what improvement they were making. I remember one remark of one of the colored men, who, when I remonstrated with him, said: "Boss, you ain't wasting fuel; you can see from the ashes what I pulled out down there that they are all burned off." From such remarks you could see that the men had no idea at all as to what they were accomplishing. But the white men have taken the greatest interest in their work. I found that the day men, in making their report and comparing it with that of the night shift, could each see what the other was doing and each would strive to outdo the other in securing better results. At first the day shift made something like 8,000 more than the night shift, and in calling the attention of the latter to this discrepancy and reasoning with them, we have accomplished the result that the night shift is now making as good a showing as the day shift. I am a firm believer in the benefits to be derived from keeping the men interested in their work. The more they know and the more they are taught the greater will be their interest and the better will be the results.

Mr. Doherty—I wanted to correct one mistake in Mr. Williams' paper, where he refers to a former paper of mine before the Association, speaking about the use of producer gas in Columbus. I referred to our experience in the use of natural gas to fire our benches. While I am on my feet I might add one other method for finding leaks in boiler valves and that is by the use of a cigar or cigarette, preferably a cigarette. You can do your work faster under favorable conditions with a cigarette than you can with a candle, but where you have many eddy currents a candle is the better method. One point that Mr. Williams did not touch upon, or I did not notice it if he did, is if you have an excess of steam over the amount needed to preheat your feed water, you will find a great saving by using it in your coal gas benches instead of using water. The figure Mr. Williams quotes on transmission of steam to water can generally be depended upon, but I would not advise anyone to depend upon a higher figure. Mr. Abell, I think, has some very complete data on that subject, covering some work which he did for me to determine the transmission of heat through diaphragms trom gas and water, steam and water and gas and gas, and roughly I would say you can depend upon about 1½ B.T.U. transmitting heat through the diaphragm from gas to gas; about 2 B T.U. to 3.2 B.T.U. gas to water, depending upon the rapidity of the circulation of your gas, and about 180 to 205 B.T.U. water to water, and about 200 to 220 B.T.U. steam to water. The very complete and excellent paper will, I think, prove a text one on the subject.

Mr. J. D. McIlhenny—I think Mr. Williams is to be congratulated upon the very exhaustive paper he has furnished to us, for I am sure it deals with topics which should interest everyone. There is no questioning the fact that the smaller economies about a gas works are too often overlooked. He spoke of ashes among the materials which were good non-conductors. In a talk I had with a Professor of Princeton University some months ago, he said they had been making quite a number of experiments as to non-conductors for steam pipes, and they wanted to find something that would be cheap and good. He said they found that the white ash from ashes was the best non-conductor to be obtained and was very cheap. By that he meant not ordinary ashes, in which are included small clinkers and particles of unconsumed coal, but the actual white, feathery ash. I do not know whether Mr. Williams mentioned in his paper the use of excess steam among other purposes for the heating up of a gas works in the winter time. That has been brought out once or twice before, I believe, at these meetings. In a certain gas works in which I am interested, this last winter we connected up all of our pumps and engines to a heating system, heated everything by means of exhaust steam and usually had steam to spare. It was done at very little expense and it is surprising to me that it is not in more general use. Another matter which has been forcibly brought to my mind within the last year is the great waste which occurs about any steam plant from small leaks. I think that we are at times too liable to permit small leaks to go unnoticed and unrepaired, thinking they amount to nothing. There are few steam plants of the best type in electric plants, in which you go, that you do not see any number of small steam leaks at different places, joints of pipes, around valves, stuffing-boxes and such places. In one plant I had an opportunity to go carefully over the figures. We could not account for a lack in efficiency in the high consumption of coal. The boilers performed their duty properly, but still there was quite a loss of steam and there was quite a number of small steam leaks about it. The joints had been made originally with corrugated copper disks on a high pressure system of pipes and there were quite a number of small leaks. They could not shut down. In fact it was thought by the superintendent that they amounted to very little, but when the opportunity arose, these joints were all gone over—everyone of them—and a new arrangement put in which was made absolutely tight and every other steam leak about the place was repaired. It was amazing the difference in efficiency which we found after these repairs were made, and there was no other way to account for it except by the stopping of all of the small steam leaks which usually go unnoticed. One economy that I do not believe Mr. Williams went fully into is in the smaller bench economies. Has he any additional information on this subject? Is there any method by which the waste heat which usually goes out of the stack can be prevented? Also the cost of radiation. Or is there any other method by which the present coal gas bench can be made a more efficient apparatus than it is to-day. There is an opportunity undoubtedly to utilize the waste heat in this regard that is certainly wasted to-day.

Mr. Klumpp—In summing up his paper, Mr. Williams speaks of the different motor powers in use about a gas works. I think he omitted a source of power that will be developed considerably in the future, that of the internal combustion engine—an engine burning oil or other liquid fuel directly in the engine cylinder. You are all probably familiar with the installation of Diesel engines at the Tyrolean Alps at the recent St. Louis Fair—these engines are of the type I refer to—and much is to be hoped for in the way of fuel economies in their operation. These engines are now running with water gas tar as a fuel, and, considering the present market price of tar, I am sure you will agree that this is undoubtedly one of the cheapest powers developed to-day. The original cost of the engines is probably somewhat greater than the cost of a first-class steam plant, including boilers, but the economy of operation will undoubtedly pay for the installation. Mr. McIlhenny just spoke of the insulation of steam pipes by means of fine ashes. Fine ash is an excellent non-conductor of heat, but owing to the great quantity of oxygen in the ash it will be necessary to cover the pipe to protect it from coming in direct contact with the ash, otherwise it will be eaten away in a short time owing to the rapid oxidation of the iron.

Mr. Osbourne—I did not notice in Mr. Williams' paper anything in reference to the exhaust gases from gas engines. I think there is something in the Question Box on that subject, although I have not had time to go over it thoroughly, and, therefore, have not seen just what has been said in reference to it. It seems to me a good field is there for fuel economy for those persons who are using gas engines. There is a "bushel" of heat there, as the fellow says, and there ought to be some way developed for utilizing that heat.

Mr. B. F. Bullock—On page 131 the author speaks about the high efficiency of open heaters, but says that his objection to them is that the water of condensation coming in contact with the feed water has a tendency to deposit in the boiler. I wish to say it is the general custom on condensing engines in large steamboats, while the water of condensation does not come in contact with the condensed water, still after this steam is condensed that water is pumped back into the boilers and is used over and over again, and I have known of boilers to be under constant use, without any let down at all, considerably over a year, and the only method used to get rid of the oil is to pass it through a filter, using only common, ordinary hay as filtering material, and about once a month, or possibly 6 weeks, a small quantity of soda is put into the feedwater which curdles the grease, and this is blown off in the same manner as boilers are usually blown off.

Mr. Williams—In regard to looking after the small losses resulting from leaks about a works, I believe that a system of inspection, where it has not been already introduced, would be a precautionary measure which would produce very beneficial results, making use of a system of inspection where every piece of apparatus in the plant, not only the machines but the piping and wiring, is placed under the control of one man. That is to say, one man is held directly responsible for the condition of the apparatus or machinery placed under his immediate charge. The retort house men will have certain matters under their control, and

one particular man is responsible for one particular thing in the retort house. By making a subdivision of work in that way and causing the men to furnish a signed report, not much labor is required in making it out, or in having this system followed. I would suggest that each man in each department furnish a signed report every week, certifying to the fact that every piece of apparatus had been looked over, and I think anyone who has not tried it will be surprised to find the decreased cost in maintenance as compared with the result where things are looked after periodically or irregularly. In regard to internal combustion engines, I was not able to get any definite figures from anyone who had them in operation. Those with whom I was in correspondence did not give me any definite figures, and for that reason I did not make any comment on it. In speaking of using or reclaiming waste heat from gas engines, I believe it has been the common practice in a number of plants to take the cooling water as it comes from the jackets, and cutting off the water as it goes into the exhaust manifold, pass the cooling water through an ordinary feed-water heater. On one side of the wall the cooling water passes and on the other side the exhaust passes. We make use of such a scheme as that in the Madison plant, and by an arrangement of by-pass valves, so that all the cooling water is not necessarily shunted through the heater, we can heat this water to any temperature we want up to the strength of our heater to resist the steam pressure, and water is sent to our boilers that furnish steam for the turbines. A very peculiar thing happened when we first started to use the cooling water for a turbine boiler. We were in the habit of pumping water from the holder tanks through the gas engine jackets and back to the holder tank again. The water that was in the holder tank had probably been in there 30 or 40 years and that water was pumped over to the gas engine jackets and went through the heater and was then sent from there over to the boilers. One day when one of the men was trying a pet-cock on the turbine, and happened to have a match burning, the steam took fire and burned a long flame. We at Madison, I think, were the first to put a gas turbine into successful operation in that line. The water that had been in the gas tank, as I say, had been there for a good many years and had become thoroughly charged with some of the lighter materials that were given up by the gas and went with the water into the boiler, and when steam was formed the gas was given off and went into the turbine and the steam would burn a blue flame 3 or 4 feet long. The reason I spoke of the trouble with the ordinary jet condenser or open heater, in which the steam comes in direct contact with the water, is the trouble that so many have experienced in getting oil into the boiler. No doubt the matter can be guarded against and the oil prevented from getting into the water, but it very frequently happens that the boiler is plugged or bagged by the oil finding its way through, and I simply spoke of it as a precautionary measure.

On motion a vote of thanks was tendered to Mr. Williams for his valuable paper.

QUESTION BOX.

The President—I will now call on Mr. Doherty, the Editor of the Question Box.

Mr. Henry L. Doherty, of New York city, who was greeted by a hearty round of applause as he came forward, said:

Mr. President and gentlemen: Last year when I presented the Question Box, I then suggested that the questions which any of the members wanted to hear discussed on the floor of the convention, be handed in by number or by copy. The President, I understand, has made a similar request this year. I will simply read the introduction as you all have a copy of the Question Box with you, and then any questions which any member desires to call attention to may be taken up and discussed orally.

Mr. Doherty then read the following Introduction to the Question Box:

After still another year's experience as Editor of the Question Box, I am able to give a more encouraging report. The first year's work called forth much sarcasm and ridicule, the second year criticism and the third year support.

The growth of support is best told by the following data:

Year.	Questions.	Contributed Answers	Contributors.
1903.....	173	685	83
1904.....	267	1,060	150
1905.....	567	4,920	519

The Question Box has heretofore been national in scope, but it is this year international. Through the courtesy and co-operation of Mr. Walter King, of the *Journal of Gas Lighting*, London, England, a number of valuable and interesting answers have been secured from prominent members of the English gas fraternity.

The magnitude of this work is much larger than is generally supposed. The expenses of this year will amount to nearly four times the revenue of the Ohio Gas Light Association for the year 1904; or, stated in other words, the expenses of this publication will be approximately 50 per cent. of the aggregate revenues of all the Gas Associations in America. It will cost $600 alone to mail the edition after it leaves the binder's hands.

In the office of the Editor there have been 7,200 hours of work in gathering the questions, sending out the lists and getting the copy ready for the press. This would mean 3 years steady work for 1 man working 8 hours per day and 300 days per year. In addition to this work you must add the work of the postal department, the reader of the question list and the work of those contributing answers. The work of contributing answers would probably represent not less than 2,000 hours.

The 400,000 words contained in this publication have been read upon their receipt by the Editor or his assistant, by a stenographer when copied, by a proof reader of the stenographer's work, again by the Editor or his assistant before going to press, by the printer in setting up the type by the printer's proof reader and by the Editor's proof reader—7 readings in all (omitting duplicate readings due to errors, etc.), or the equivalent of reading 2,800,000 words.

For 3 months 4 stenographers have been busy copying answers, another stenographer on correspondence, 3 assistants to the Editor 2 clerks at all times, and occasionally 10 clerks when a large batch of mail was sent out.

Seven thousand men were invited to contribute, 2,200 have signified their interest in the publication, and 519 have contributed answers. If all who are interested or promised to contribute had done so the edition would have been printed in many volumes like the Encyclopedia Britannica. The gas fraternity is composed of men of good intentions, but many of them do not realize the flight of time and their memories are treacherous. The edition printed on light weight paper will consume 8,000 pounds. Requests for copies will come in from all sorts of people, and especially from engineers following other branches of work. There is much I would like to say as an introduction to this work, but I do not want to say so much that none of it will be read. One of the interesting points of the work is to note, from correspondence received, how the idea, the plan and the methods pursued strike the different members of the gas fraternity. I can best illustrate my point by inserting some correspondence.

Last year a man who had been asked to contribute answers to questions wrote back and said: "I have no use for the Ohio Gas Light Association; they are too aggressive." Later, when talking to a man who owns stock in several gas companies, the latter said to me, speaking about the Question Box: "This is a wonderful work and must be very beneficial to gas men; now take our man up there" (referring to the man who said we were too aggressive), "he is a hard worker but is not very aggressive, but a work like this must be of great benefit to him."

When I opened my mail one morning I found amongst other letters these two:

"November 14, 1904.

"Dear Sir: I will do what I can to assist in the work. * * * I would not have believed it possible for anyone to have made the success of this work which you have accomplished. * * * It is your force and persistence which have brought success. Your determination and persistence have commanded my admiration. Yours truly, ——."

"November 15, 1904.

"Dear Sir: I am in receipt of your letter of the 12th inst., and a great many previous to that date, asking me to send you the names of men that I think would be able and willing to assist in the Question Box work. Now, Mr. Doherty, do you suppose for one minute that if I knew anyone that was willing to go into that work that I would not have reported them to you long before this? I admire people that have a reasonable amount of perseverance, but when they get beyond that they become a bore. Pardon me for using the term. ——————.

To this letter I replied as follows:

"November 30, 1904.

"Dear Sir: Your letter of the 15th has just been called to my attention. Not to exceed three communications have been sent out and I cannot see that three communications would so inconvenience you that you should feel called upon to write a letter so bluntly discourteous, when to simply have written across one of the return postal cards, 'Am not interested,' would have caused your name to be dropped from the mailing list. It is not my purpose to annoy anyone, but I did not suppose that three pieces of mail matter, which could be recognized at a glance to relate to the 'Question Box,' would prove so annoying as to excite such a letter as yours of the 15th inst.

"It is not pleasant to be called a 'bore,' but as I seem already to have impressed you as such, I intend to try and convince you that my efforts as 'Question Box Editor' would not be effective if not persistent, and yet they have not been unduly persistent.

"First, failure to receive a reply to my first communication could

not be taken as conclusive evidence that you knew of no one willing to contribute. Others failed to reply to my first communication, but did reply to the second or third communication, but in some instances thanked me for calling their attention to the matter again.

"Now, it really puzzles me why you, your associates, and your employees should be unwilling to assist in the Question Box work. It puzzles me still more why you should be offended by a request to do so.

"The Question Box is an educator. You probably feel that you need no further education. You are the manager of a large property and may perhaps feel yourself fully educated, fully equipped.

"Where did you get this education? Not wholly from your own work, your own experience, your own observations. You had available many valuable contributions to gas literature made by unselfish operating men, who were willing to assist in making progress and willing to contribute to the balance of the fraternity.

"You have been assisted by the work of others and why should you not in turn assist.

"If the work is all a mistake and if your views are general, I want to drop the work. Are your views right or wrong? I can only judge from such evidence as is given me. Five criticisms have come to me, and against the 5 criticisms, 1,900 men interested in the gas business have given approval to the Question Box work, either by personal letter to the Editor, by past contributions or by promise of future contributions.

"If the plan is right, it deserves the support of such men as yourself. If it is wrong, it should be abandoned. I cannot believe your former letter was the result of careful thought.

"If the views here expressed should put the matter in a different light, I would be glad of your assurance of the fact and your help in the work.

"Honest opinions are always welcomed by me. It is a good thing to be told how 'others see us.' In this matter, however, I am simply the agent for a Gas Association, and, like the Chairman of the House Committee at the Club, I must accept what abuse is tendered.

"(Signed.) Yours truly, HENRY L. DOHERTY, Editor."

To my letter of November 30 I received a satisfactory reply under date of December 8, in which the writer said: "Now, as to the plan of the Question Box being right, there is no doubt in my mind of that." He also made a contribution.

A few days after the receipt of this letter, I received a letter from Secretary Jones, inclosing a letter from Mr. Greenough, of Cleveland, which follows, together with the balance of the correspondence.

Mr. Greenough has had sufficient courage of his convictions to state his views and we "ought to be thankful for that," but he is the only critic who has given us an opportunity of reply that has not turned from a critic to a supporter.

There is no reason to think that Mr. Greenough and the 5 or 6 other critics will be run over by the 1,900 other men, but we don't want Mr. Greenough and the other 5 or 6 to insist on trying to run over the other 1,900 as they seem very much inclined to do.

Contrast Mr. Greenough's letter with that of Martin Longfellow, of Hamilton, O., received almost the same date, as follows:

"I appreciate the great good you are doing, and to my mind the Question Box is one of the best means of bringing out the vital points which mean so much to the gas fraternity."

And Mr. C. H. Raynor, of Dayton, O., says:

"I admire the persistent effort with which you have pushed this matter. Wishing you every success, etc."

Mr. Greenough's letter:

'CLEVELAND, O., November 14.

"Mr. T. C. Jones, Delaware Gas Co., Delaware, O.: Dear Mr. Jones—I recently received a letter from you in regard to extending the membership of the Ohio Gas Light Association, and I have also received this morning a letter from Mr. Doherty in regard to the Question Box and requesting the courtesy of an early reply.

"I certainly do not wish to be discourteous to Mr. Doherty nor by any possibility to yourself, but I think it right to state frankly that I am not in sympathy with the work which the Ohio Gas Association is doing. When that Association was formed it had a peculiar value. It was made up of men whose circumstances were practically the same. Their supply of coal was from the same district, they were subject to the same legislation at Columbus, and their talks at their meetings frequently, as you know, without being reported, were of great value to each other.

"Since the Association has gone into the field occupied already by the American and Western Associations, it seems to me that it has made a mistake, and the meetings have lost their value entirely so far as I am concerned, nor am I in sympathy with the way in which the Question Box is being pushed. When a Question Box was opened in the Ohio meeting in old times, or in the New England meeting, the President would call upon somebody who was familiar with the subject to express himself on a question and the member was never unwilling to do so to the best of his ability. Now that the Question Box affords opportunities for any person to express his opinion whether it is of value or not, it seems to me to be pushed altogether too far.

"I was reading in the JOURNAL some of the answers to some of the questions after the last meeting, and it seems to me they were frequently given by the people who did not know what they were talking about. I certainly would not care to answer in writing one of the questions if I were to have set up against my opinion that of some person whose experience on the question was totally inadequate, which makes such questions and answers more or less valueless.

"You will, I know, excuse my writing to you thus frankly, but I wish to have you understand that while I take great interest in assisting any way I can any of the Ohio companies with any information that I have, I am not in sympathy with the present movement and do not propose to further it. Yours very truly,

"(Signed.) M. S. GREENOUGH, President."

DELAWARE, O., November, 16, 1904.

"Mr. M. S. Greenough, Cleveland, O.: My Dear Mr. Greenough—I have received your letter of the 14th inst., and regret exceedingly the position you take in regard to the Ohio Gas Light Association.

"For many years the Association has not been considered a State organization except in name, and now 80 per cent. of the members live beyond the borders of the State. You were elected an honorary member in 1889, when, I believe, you were a resident of Massachusetts.

"There was only one time in the history of the Association that it tried to deal with State legislative matters, and that as you know was not satisfactory and was afterwards greatly deplored by the officers of the Association.

I do not think an organization should be criticized for being enterprising and trying to do the best they can. We are simply expanding and trying to promote the advancement of the industry along the lines of the constitution of the Association which was adopted at its first meeting, September 17, 1884, and read as follows: 'The objects of this Association shall be the promotion and advancement of knowledge, scientific and practical, in all matters relating to the construction and management of gas works, and the manufacture, distribution and consumption of gas.'

"The 'Progressive Age' of April 1, 1904, in an editorial says of the Ohio Association that 'probably the most potent factor is that the Ohio spells s-u-c-c-e-s s. It stands to deliver the goods and gas men know it. A close study of the proceedings as we publish them will show why this Association is attaining national importance.'

"Dozens of congratulatory letters on the Question Box have been received from the most eminent men in this country and England. The London *Journal of Gas Lighting*, August 2, 1904, has a very lengthy editorial, commending most highly the brilliant work of the Editor of the Question Box.

"I know there are many gas men who think as you—that we are encroaching upon the preserves of the American and Western Associations. But I am sure from the results we are accomplishing that there is a welcome field for us along the lines we are pursuing.

"I assure you that any suggestions you may offer in regard to the improvement of the Association will be gratefully received. With kind personal regards, I am, Very truly yours, T. C. JONES, Secretary.

November, 25, 1904.

"Mr. T. C. Jones, Delaware, O.: Dear Mr. Jones—I have your letter of the 16th, together with copy of Mr. Greenough's letter of the 14th. It is quite apparent that the officers and the department editors of the Ohio Gas Light Association are wrong, else Mr. Greenough is wrong. I have given the subject careful and serious consideration since receiving your letter, and have not only concluded that the officers are right, but that Mr. Greenough will agree in this conclusion if the case is properly presented to him.

"I must first sum up the criticisms made by Mr. Greenough, putting them perhaps in more severe form than Mr. Greenough states them.

"1. That the Association was organized as strictly a State organization, and that in going beyond the borders of the State it is lessening the good it may do the Ohio members and is also working an injury on others.

"2. That the Ohio Gas Light Association is encroaching on the field of the Western and the American.

"3. That the Question Box is improperly handled and should be confined to oral answers on the floor.

"4. That contributors to the Question Box should be limited to such persons of experience as the president might select.

"5. That those members of the gas fraternity who believe themselves to be recognized authorities on the gas business, cannot afford to give written answers unless those of unrecognized authority are excluded.

In addition to the above, Mr. Greenough, in objecting to the Association going beyond the State for members, must particularly object to—

"6. The active campaign for new members which you conducted last year.

"Now it is my pleasure to answer these criticisms starting with the first objection; the right of the Ohio Association to go beyond the borders of the State.

"1. The Association was not organized as strictly a State organization. Membership was invited from other States, and Mr. H. S. Doug-

las, of Michigan, and Mr. Connelly, of Pennsylvania, were very prominent in its organization.

"2. Had the organization been confined to the State of Ohio only, the disastrous competition of natural gas would have reduced the organization to a point where it would have become so meager and useless as to have necessitated its abandonment.

"3. Owing to natural gas competition and other causes a great number of loyal and working members, residents of the State of Ohio, were compelled to seek their fortunes elsewhere, and amongst these men I mention Emerson McMillin, Irvin Butterworth, A. P. Lathrop, C. W. Andrews, George Whysall, E. H. Jenkins and Jerome Penn, all of whom were ex-Presidents of the Association, and many other men who have done valuable work for the Association. To have limited the organization to a State affair would have barred these men from participation in the Association's affairs.

"4. Owing to its ability to secure more talent, it seems to me that the Ohio Gas Light Association has made itself more valuable to the Ohio members by going beyond the borders of that State.

"Now, for the second criticism:

"1. What is the territory of the American Association and what are its inherent rights?

"2. What is the territory of the Western Association and what are its inherent rights?

"3. Do these territories conflict?

"4. Which has the clear title?

"5. Have either or both of these Associations the right to prevent any element of American gas men to unite together for their mutual advantage, or to forbid any other existing Associations to invite other gas men to join with them.

"I cannot see any answers to these questions which would forbid the Ohio Association to follow its present course. The work of the Ohio Association has in no way lessened the opportunity of the other Associations.

"Now for the third criticism, that the Question Box is improperly handled, and should be confined to oral discussions on the floor.

"The editor will welcome any suggestions of how it should be handled, and would be greatly pleased to have suggestions from such men as Mr. Greenough, who have had long experience in Association work. If, however, Mr. Greenough is of the opinion that answers should be made orally from the floor by such members as the president may select, I shall be compelled to disagree with him for the following excellent reasons:

"1. This method not only confines the answers to questions to

"(a) The few gas men who attend the conventions; but

"(b) To those in the convention hall at the time the question is brought up, and

"(c) Without any opportunity for previous preparation; and also

"(d) Limits it to 1 or 2 men selected by the president, who possibly is not even reasonably familiar with the work or knowledge of 3 per cent. of the men sitting before him.

"Compare, if you will, the opportunity under this method of securing a correct and complete answer to a question with the present Question Box method, where the question is submitted to 2,000 men with ample opportunity for preparation.

"2. From an economic standpoint, I can see no value in Mr. Greenough's plan. Time at a convention costs money. Taking the last convention of the American Association at Washington, I will assume 300 delegates were in attendance at an average cost of $100 each, or a total of $30,000; deducting the time required for the election of officers, reading reports, etc., etc., the working time of the convention did not exceed 10 hours or 600 minutes, making the cost of the convention $50 a minute. There were 267 questions in the last Question Box, to which 1,052 answers were contributed by 150 contributors. We could not figure on less than 10 minutes to each question, requiring $267 \times 10 = 2{,}670$ minutes at a cost of $50 per minute = $133,500, against a cost of the last Question Box under the present method of handling of about $2,000.

"To the fourth criticism, that the president should select the proper person to answer questions. I can only reply that this seems impossible to me, but if Mr. Greenough can show us how this can be done, or a better method used than at present, I will thank him.

"To the fifth criticism—that men like Mr. Greenough cannot offer answers unless incompetent persons are excluded, I would say that I do not see the force of this objection. Answers from Mr. Greenough would be welcomed by the Editor and would undoubtedly be given great weight by the reader. A correct answer would not be any less correct because others held views to the contrary, and a great man's reputation is in no way tarnished by an expression of views on a subject simply because incompetent men may also express their views. Mr. Greenough has possibly overlooked the fact that we have taken measures to have the Question Box information corrected and annotated. What Mr. Greenough objects to could be very easily remedied if he and others who object to the inaccuracy of the Question Box information, would give their help in its revision.

"Again, Mr. Greenough does not seem to realize that if the recognized authorities would contribute to the extent of their ability, there would be few questions which would not have a correct answer. The man who answers the questions is trying to build. The man who refuses to contribute, but merely stands back and criticizes, is not contributing in the least to progress.

"The inaccuracy of the answers in the Question Box has been a source of criticism. I cannot see how anyone can justly demand a higher standard for the Question Box than for the proceedings of our Associations. I have exercised very little censorship over the answers offered and do not intend to discourage contributors by so doing. No censorship is exercised over the discussions held on the floors of our conventions. Surely Mr. Greenough will not maintain that all views expressed in discussions at our conventions are correct, neither can he maintain that only recognized authorities avail themselves of the privilege of the floor.

"To the sixth criticism, which I have deduced from Mr. Greenough's letter, I would offer the following explanation, which I think should be sufficient justification of the campaign:

"The methods used by the Ohio Gas Light Association to build up and strengthen their organization, are the identical means which have been successfully used to build up individual gas companies. If the Association is doing good work, it is making the results of this good work most effective by reaching the largest possible number of men in the gas fraternity. It has used all funds received in the interests of bettering its work. Perhaps its work might be better directed, but the present officers and department editors are doing the best they know how. To secure better work demands the hearty and earnest co-operation of men like Mr. Greenough. He says: 'I am not in sympathy with the present movement, and do not propose to further it.' Mr. Greenough should tell us what movement he will be in sympathy with to secure more effective Association work and what he will do to further it.

"I do not think it pays to be intolerant about anything, and this is why I am setting out my opinions and reasons therefor in such detailed shape. Mr. Greenough gives, as his opinion, that the Association is making a mistake, but does not give his reasons in sufficient detail to convince me that such is the case. He also says that Question Box work is being improperly handled, but offers no suggestion for improvement which appeals to my reason.

"In answer to his opinion I have tried to tell you why I think it is being properly handled, so my error can be pointed out to me. There is no doubt my methods can be improved, and suggestions which promise improvement will be gladly received.

"While the majority opinion does not make a thing right, it is nevertheless competent as evidence. Over 1,900 gas men have signified their approval of the Question Box, as now conducted, either by letter to the Editor or by offers of assistance in this year's work. It is true that few of these men have had the experience in the gas business that Mr. Greenough has enjoyed, and neither do the majority of them hold such important positions, nor do they enjoy his prominence in the gas fraternity, and yet the fact remains that hundreds of men believe they benefit by it. Against the 1,900 who are on record as favoring the Question Box, 5 criticisms have been received. It is true that all 5 of these criticisms have come from men more or less prominent in the gas fraternity, and it is also true that not one of these criticisms has come from a single man who has assisted in the Question Box work.

"I do not see that it does them any harm, and if 1,900 members of the gas fraternity want it carried on, I do not think that 5 men should protest against it and virtually demand its discontinuation. I am writing you this at length, believing that if you will present some of these views to Mr. Greenough, he will not only withdraw his protest but will accord the movement his hearty support.

"Yours sincerely, HENRY L. DOHERTY, Editor."

"DELAWARE, O., November 29, 1904.

"Mr. M. S. Greenough, Cleveland, O.: Dear Mr. Greenough—Referring to our recent correspondence relative to Ohio Association matters, I am sending you herewith a letter which I have just received from Mr. Doherty bearing on the subject.

"Among many members of the Ohio Association there has always been a spirit of faithful allegiance to the organization, and whatever

success the Association has attained is due to the persistent, and, I think, laudable work of these men. Members have moved away from the State hundreds of miles, yet their loyal interest in the Association has always continued. Such a member is Mr. Doherty; and I am sure you will fully understand his position after reading his letter.

"Again, Mr. Greenough, I wish to assure you that the men who are doing the active work of the Association are doing their best, and we need your advice, co-operation and assistance, which I sincerely trust we may have.

"Will you be kind enough to return Mr. Doherty's letter?

"(Signed.) Yours respectfully, T. C. JONES."

"CLEVELAND, O., Dec. 1, 1904.

"T. C. Jones, Secretary, Delaware, O.: Dear Mr. Jones—I return you herewith Mr. Doherty's letter, which I have read with much interest. It seems hardly necessary for me to assert that I have always been in favor of advancing the interests of our profession. You know well enough that we have always been ready to do our share and that our works have always been open to visitors and our manufacturing books to any proper person. It would seem as though myself and the half dozen other members who have taken a similar position were apparently drags upon the wheels of the car of progress, and were liable to be run over by the 1,900 other people who are, as Mr. Doherty says, pleased with the present plan. And yet I am not wholly convinced. At the same time, Mr. Jones, I am very desirous of doing anything you, personally, wish me to do, and if there is any special matter in which you think my experience is of value, I will reconsider my refusal to give it attention. I am, yours very truly,

"(Signed.) M. S. GREENOUGH."

Here is another criticism: "February 2, 1905.

"Dear Sir: Please drop my name from your mailing list. As I can assure you I am not in sympathy with the yellow journal methods used by you or the Ohio Gas Light Association.

"The Question Box, without a doubt, is a very good self-advertising scheme, but beyond that I do not see how it possesses any true merit. Your persistence is not only impertinent but very annoying. Other men may remain silent when your methods are thus thrust upon them, but I believe in telling you what I think, and also what other gas men think. Yours truly, ————."

"February 6, 1905.

"Dear Sir: Your letter of the 2d received. Your views are expressed in brutal frankness and surprise me very much. I do not like to be the object of such an attack, but I know that I have been severely criticized for my work as Question Box Editor by others, and I much prefer your open attack to the indirect methods used by them.

"You give me an opportunity for defense and they do not. You must believe what you say or you would not make open charges, while others say what they do not believe; therefore, have not the courage to make open charges. If the sweeping charges you make are true and you can convince me of this, you will do me a great favor. I do not yet agree with you, for your charges are not supported by the statement of any good reasons. One of us must be mistaken on this point and we should be able to agree.

"I will sum up your charges and attempt to answer them.

"1. You charge the Ohio Gas Association with yellow journal methods; and,

"2. You charge the Question Box publication with lack of merit; and,

"3. You charge me with (a) self-advertisement, and (b) 'yellow journal methods,' and (c) impertinent persistence.

"You not only speak for yourself, but others who are more timid. Now as you have assumed the right to speak for others, I demand to know who they are.

"There are about 2,200 gas men that you do not speak for. Whom do you speak for?

"Your charge of 'yellow journal methods' by the Ohio Gas Light Association does not give me a clear idea of what you mean. 'Yellow journalism,' amongst other things, is synonymous for activity and aggressiveness. This is surely the only point in common between the methods of the Ohio Gas Light Association and 'yellow journal methods.' Activity and aggressiveness are welcome in every other profession or industry of equal importance, and it is, I think, welcome to the bulk of the gas fraternity, but unwelcome to a certain few.

"In answer to your charge that the Question Box publication is lacking in merit, I can only say that I disagree with you. I do not think you would make this statement if thoroughly familiar with its contents I am sending you under separate cover a copy of the publication for 1904. Before accepting your statement as final I would like to have you examine it closely. If you still maintain the views you have expressed I shall be greatly surprised. You will find contributions from 150 members of the gas fraternity and many of them men of recognized ability and standing. You are indeed a fortunate man if you can learn nothing new from it. Several hundred men have borne testimony of its value. When you are ready to repeat your statement I will have more to say on this same point. You accuse me of:

"(a) Self-advertising.

"(b) Yellow journal methods, and

"(c) Impertinent persistence.

"On the first charge you should give me credit for a little common sense. I can find cheaper and more effective methods of self-advertising, if that is what I want.

"As to methods. I use those which I believe to be best. Perhaps my methods are wrong, but they are the best I know.

"Your charge of impertinence is the only one which worries me in the least. I do not mean to be impertinent, and do not think I am. Persistent I must be, or the Question Box would not be a success; but I hope I have not been impertinent or that I have even seemed impertinent. Look over my communications and see if you do not agree that they are not impertinent. Tell me if they are, and also tell me if you think I could be successful in this work were I any less persistent.

"There are a few men in the gas business who are critics only. Some realize their position and others do not. For those who do I have only indifference, and for those who do not I have sympathy. I do not want to think of you as being in either class.

"You are a man of good position and influence. You could do much for association work and the members of the gas fraternity. What have you done? Have you done all you should? The time you spent in criticising my work could have been better used in contributing some information to the gas fraternity through the Question Box as a medium.

"Reply to this letter or not, as you see fit. As you took the trouble to tell me what you thought of our work, I take it that you would like to have your letter given the greatest publicity possible. Your letter, my reply and your reply to this letter will be published in the preface of the Question Box. Say what you like in your reply. Make it as bitter as you wish, and you are perfectly free to score me or my work.

"Yours sincerely, HENRY L. DOHERTY, Editor."

"February 8, 1905.

"Sir: Your favor of the 6th inst. before me. What right have you to publish my letter of the 2d inst.? You certainly know that in so doing you would commit a gross breach of ethics, and I forbid you to use it. Yours truly, ————."

"February 13, 1905.

"Dear Sir: Your letter of the 8th received. You surely have no right to bid or forbid me to do or not to do anything. You forget that you wrote me in my official capacity as Editor, and that not only gives me the right to publish your letter, but it is my duty to do so.

"Your letter will be published, and you might as well reconcile yourself to the fact. Whether I will publish your name or anything that will identify you with the letter depends upon what I shall think best when the proper time comes.

"You have replied to my letter, but have not answered it. I am a busy man, and yet I took time to answer your letter of the 2d, and tried to be frank, honest and inoffensive. Don't you think I deserve an answer to my letter? Yours truly, HENRY L. DOHERTY Editor."

"February 16, 1905.

"Dear Sir: Your letter of the 13th at hand. I wish to say that I have examined the book you forwarded me, and I have re-read our correspondence. I am frank to admit that now I do not agree with the views expressed in my first letter, and would like to withdraw them. My intention was to speak for myself. It was unfortunate that I worded my letter otherwise, consequently you should not demand from me the names of your other critics. I realize now that the views I expressed were only impressions I received from what others said, so I wish to withdraw them and state that they were made in haste, and not well considered. On second thought and some investigation I admit the Question Box has considerable merit and the Association is deserving of praise rather than criticism. I prefer that you do not use this correspondence, and I herewith make the request that you do not publish it. Some time in the near future I will write you a full answer to your letter, when I have given the subject more thought, and I wish to write it when I am free from any personal feeling in the matter.

"Yours truly, ————."

The following extracts from letters suggest other thoughts:

(a) "I want to commend in highest terms your way of getting at the real questions that we are continually meeting."

(b) "The method is extremely direct and practical, and should be copied in other branches of engineering. It would do more to promote development of engineering knowledge than all the colleges in the land are now doing."

(c) "I most heartily indorse your Question Box plan, and wish the Amercian Society of Mechanical Engineers had such a plan."

(d) "The full appreciation of your work is only possible to me when I think what wonderful progress it would bring in mechanical engineering if the American Society of Mechanical Engineers would adopt it. It would bring improvement in shop and factory practice, and in fact in all industrial work."

The above extracts are submitted chiefly to suggest an extension of the idea and perhaps co-operation by all engineering branches.

Here is an example of another type of letter received:

"And now may I make a mild suggestion? In gathering this material would it not be a good idea to suggest, along special lines, what data would be of use to you? There are in the gas world to-day any number of young college graduates like myself who have been trained in taking observations and who ought to gather a lot of valuable material if they had an idea of what is wanted and what is not wanted. In other words, hasten the day when a gas engineer's 'Kent' is possible."

Other letters of the same type have been received, but this is sufficient to form a text for what I want to say, and a portion of which I have tried to say before in the preface of previous Question Boxes.

1. I cannot outline in a specific way what information is wanted, and I deny that any one man can do so. One of the chief virtues of the Question Box is the fact that it will continue to develop points or questions on information wanted. Look in any handbook for information wanted and it may not be there. Why? Because the author did not think it to be needed? It was probably because he did not think of this point. The most conspicuous point I have noticed about gas engineering handbooks is the information they do not contain. I do not mean this as a criticism of the author, but merely of the handbook. No author could anticipate any great amount of the information wanted. The approximately perfect handbook must be a collation of the work of many men. Unless it is known what information is wanted the perfect handbook cannot be written.

Now, what we are trying to do is to build up a perfect handbook. We must use much that has already been published, but we want to put it in its most brief, simple and accurate form. We want a great deal of information that has not yet appeared in print. If this information is possessed by some men in the gas business we want to make it available to all students through the medium of the Question Box. We want to make all known information available and narrow down the field which will demand original investigation and research work.

It is, therefore, apparent that each contributor should determine what information might have value. To those who will write the handbook will be assigned the task of determining what shall be excluded. It is the contributor's duty to submit everything which might be of value.

It is perhaps unfortunate that we have called this work by the name of the Question Box. What we are trying to do is to gather all information together which will be of value to gas men, and to then put it in the most available form. We are only on the threshold of that portion of the work which will bring results. We have accomplished much of the work necessary to success, and the part which seemed the most impossible, viz., to awaken interest and secure the co-operation of a great army of workers. We now have over 500 contributors. From this number we hope to develop a number of volunteers who will work along their own lines and gather much data for the prospective handbook. I will call your attention to certain facts, and will suggest certain methods. These facts and suggestions will enable the contributors to develop others.

Much of our gas literature is mere verbiage. It is voluminous for the real information of value contained. It is badly titled and not well indexed. It is so constructed that good indexing is impossible. Information of value which is of the size of a pin, may be hidden in a mass of verbiage as large as a haystack. Information of value to gas men is contained in other than gas literature, such as the proceedings and trade journals of other societies and industries. A great deal of valuable information could be culled from the engineering handbooks of other professions and from the proceedings of societies, engineering books and trade journals published in foreign languages.

If those who are willing to assist in this work will cull valuable information from these sources, putting it in best possible form and framing a suitable question which will act as a text, and will report all new investigation work in this same manner, these contributions, in addition to the information brought out by the ordinary questions and answers, will soon put an immense amount of knowledge in available shape.

Keep a notebook at hand and jot down all information as it comes to you. Whenever you want information, write out your question, and whether you secure the information or not send the question in and answer it if you can.

The work has become so enormous and so many answers are submitted at a late date that any great amount of editing is impossible. About all that can be done is to receive the answers, sort, print and index them. The work of correcting, condensing and editing must fall almost entirely upon the revision committee. This committee will welcome all volunteer help, and to contribute to this work you need only take this publication and re write one answer from all of the answers published, supplying as much additional information as you can, citing references wherever possible. Such contributions should be sent to Dr. Harrop.

We have added certain new features to the Question Box this year. Questions are printed in heavy faced type; the numbers of the questions appearing on a page are shown in the top margin. Blank pages have been inserted on which additional questions are to be written as they occur to the reader. These questions are to be sent to the Editor when called for.

Criticisms and other forms of opposition have undoubtedly prevented some people from becoming contributors. I wish I could say something which would be convincing encouragement against these criticisms. You must remember that there is no weakness in this work that would exist if it were properly supported and when this is pointed out to honest critics they will direct their efforts to support, rather than criticise. To the chronic critic there is nothing we can say. If he can't knock on one point he will knock on some other. Better tell him to get an ax and do his knocking in such a way that he can look back on his work with pride.

Mr. Chas. G. Dawes, who has made fame and fortune in gas undertakings, but who is better known to fame in financial circles, has a very interesting article in the Saturday *Evening Post*, of January 18, 1905, in which he says: * * * "but inactive men and inert things do not interest other men in this rushing day, and the business critic, to get his audience, must swing his battle-ax at the doers and not at the drones. The world gives quick applause to the reckless critic. To the young man ambitious to be known, the swift road to public notice is through denunciation of the work or personality of others. The long, hard road to general respect may commence in criticism, but it must be honest criticism designed to destroy evils, not simply individuals except as necessarily involved in the destruction of evils, and then this road must lead to constructive efforts and finally to the patient bearing of the criticisms of others—for it is the doer of things, who now and always will stand, as in the past, the shining mark for both the fair and the unfair critic." There are 3 classes to which you may belong, the doers, the drones or the critics. It is possible for you to belong to both of the latter classes. I urge you to join forces with the doers and say, "I want to be a builder;" we have a surplus of drones and critics.

One of our large magazines, the *Cosmopolitan*, recently said: "The keynote of the world's progress for 1905 will be 'Truth.' Men and women have come to recognize that to make progress means a free mind, steadfast for fact instead of tradition. In proportion as they have learned to work with untrammeled brain, there has been progress in every department of life, in science, in government, in education, in literature. Those who would achieve must stand with open minds ready to receive the truth."

We are searching for truth and expect to make progress on the basis of truth. Every man who is in sympathy with this work should be represented next year as a contributor.

Our methods next year in the interest of economy will have to be changed. We ought not to be compelled to coax to the same extent and will be unable to do so. Our work so far has been primarily directed to the organization of forces. We now have an organization with which others will be proud to identify themselves. Hundreds of men are voluntarily praising the work and hundreds more are interested. Recognition of the extent of this appreciation will induce others to become contributors to the work without so much expensive coaxing.

The Editor has been unable to do much of the editorial work this year and has been compelled to delegate it very largely to others. For valuable assistance he wishes to thank Frank W. Frueauff, J. Chas. Andrews, Geo. Steinwedell and R. G. Griswold.

The Editor is simply an agent and the work would be impossible except for the generosity of the contributors. The Editor's appreciation of the work of the contributors is unlimited. The list of contributors in Index No. 1 is the enumeration of unselfish men whose fraternity is beyond question. This is, in a way, a Roll of Honor.

(To be Continued)

[Prepared for the JOURNAL.]

The Automobile Department of the Plumber's and Pipe Fitter's Shop.

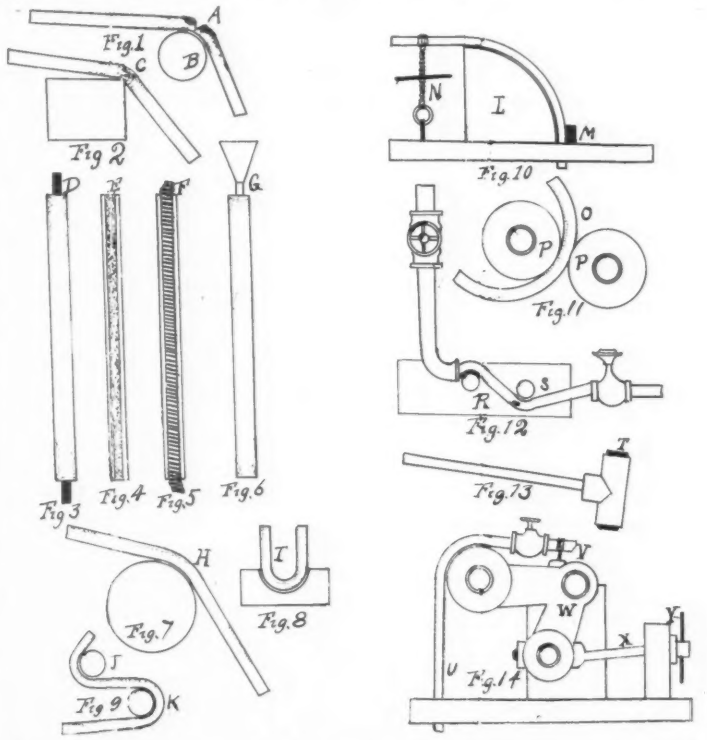
By "G. D. R."

At first nearly all of the pipe fitters of the country objected to having anything to do with repair or construction work on the pipes, valves, tubes and connections of automobile gasoline or other tanks and parts. The plumbers did not have the time to bother with every automobile that happened to break down in the vicinity of their shops; but after a while, more for accommodation than anything alse, some of the gas and hot water pipe men began helping "autoists" out of a hole by repairing broken pipes, fractured tubes and valves of the machines. For a time this accommodation work was accomplished oftentimes without charge. In time a fee was established. Sometimes a well-to-do autoist out for a spin would drop a good sized coin into the palm of the plumber who had fixed some part of the machine in an emergency. It was only a short step from this point to the making of rates and putting in of devices for meeting the new traffic. It has been principally the plumbing shops along the highways of the automobiles that have secured this business. The autoist takes it for granted that the plumber has the necessary equipments and experience for repairing and adjusting the piping of the motor cars, and he goes to these people when he needs something done on his machine. It is of the automobile tankage tubes, frame tubes and general piping of the various designs of machines that are referred to in the annexed sketches.

These drawings are calculated to give "ideas" concerning the bending and adjusting of the peculiar types of tubes and pipes used in the motor service—the pipes requiring humoring. In one case I saw an attempt to bend the pipes for a certain purpose, resulting in fracturing the delicate shell as at *A*, Fig. 1. The bending was attempted cold and without "filling" the pipe. *B* is a shaft of metal. Sometimes, instead of the pipe wall breaking, the shell will collapse, as at *C*, Fig. 2. A good way to bend either tubes or the framework or the pipes of the oil or steam systems of the modern automobile is to "fill" the hollows of the same according to one of the methods next illustrated. The pipes can be bent cold. Some workmen use the simple, straight wire system, consisting of a piece of rod or wire of ample size, passed through the pipe or tube, like *D*, Fig. 3. With this protection for the walls the pipe can be bent to various forms. I noticed in some shops the "clay filling" system was used, as shown at *E*, Fig. 4. This method, or the putty way, is suitable for general service, as the pipes can be bent cold if properly packed with clay, putty or fluid rosin, run in hot and permitted to harden. The spiral spring system is shown in Fig. 5 at *F*, consisting of the common form of spring wound to correct diameter and inserted in the tube as shown. Then the pipe may be bent readily without danger of causing the walls to collapse. Some of the workmen have sets of wires and spiral springs arranged in different diameters and in readiness for immediate service. The rosin method consists in the use of the tunnel *G*, at the tube or pipe end, as in Fig. 6. The melted rosin is run into the pipe through this tunnel and is permitted to cool and harden. Fig. 7 is one of the disk-bending devices, with the pipe *H* upon it. Pressure is created by hand power at each end of the pipe, and the pipe is bent about the form. Sometimes the U-shaped effects are made by using a model like that in Fig. 8, shaped from wood. The hammer is used with pipes of small size and light work. For heavier work, a form of metal is introduced at *I*, and pressure exerted from above with a screw press to force the pipe into the form. Sometimes we find that pins, like *J* and *K*, are fitted to a base of hardwood, as in Fig. 9, and the necessary turns effected in the pipe by bending the same about these pivots, as shown. One form for bending I saw is shown in Fig. 10, consisting of the wood block *L*, shaped for the half circle and arranged to a substantial base of wood. There is a check pin at *M*, back of which the pipe or tube is adjusted and bent over the form to a point where the twisting arrangement at *N* can be applied. This is a piece of rope through which a stick passes. By turning the stick the rope is taken up and the pipe is drawn down tight to the block.

Often a common pair of metal disks are adjusted in journals in a wood frame on a shaft and arranged to operate on the pipe, as in Fig. 11, in which the pipe is marked *O*, and the pair of rolls gripping the same *P*, *P*. By running the pipe through the rolls two or three times, the pipe assumes the proper curve. In this way the curve can be described and held. The rolls are usually operated by a belt extended from the main shaft of the shop to the customary tight-and-loose pulley on the shaft of the wheels. Fig. 12 is a form of bending device for making a curve formation in the system of pipe of the plan shown. Not infrequently it occurs that there is a special bend to be made in some system of piping in which there are valves and connection that prevent the use of the hammer or the vise in connection therewith; therefore, the workmen usually construct a base board with the necessary set pins, as at *R* and *S* in the drawing. These pins are commonly hardwood, and are from 1 inch to 2 inches in diameter and about 3 inches long. They fit into holes bored in the base board and are strong. Then the workman takes the filled pipe or tube and, regardless of the fact that there may be one or more valves or other connections, he can easily effect required curves in the same by proper adjustment and application of pressure. A hammer made up as in Fig. 13 is useful for this work. The part marked *T* is lead. This forms a soft head and can be used freely on delicate work.

In order to meet the needs of certain types of automobile traffic one plumber put in a pipe and tube bending of his own construction, designed as in Fig. 14. The part *W* is cast iron, moulded with the circular flanges as shown. The elbow-like bending arrangement is studded to a post of wood at *V*. The pipe to be bent is inserted in a hole in the foundation or platform of the apparatus as at *U* and drops over to the place where the connection is made with the metal work of the elbow with cords or wire as indicated. Then the lever *V* is grasped and force is applied to push the rod *X* forward. This causes the elbow to advance the bending cam or disk and bend the tube as shown. The position of the device is shown just as it completes the bend. It is a good idea to have a mechanical-like device of this order to bend tubes or pipes when a number are to be bent the same way.



Temperature Limits for Electrical Machinery.

The London *Electrical Review*, in commenting on a report by the Sub-committee on Physical Standards of the Engineering Standards Committee on the temperature experiments which have been carried out by Mr. Rayner under the direction of Dr. Glazebrook, at the National Physical Laboratory, remarks:

The report constitutes a very interesting and valuable record of the investigations in question. One remarkable feature constantly in evidence, which we feel bound to criticize, is that, from a reading of the report, the impression is conveyed in many cases that certain important phenomena have on this occasion been observed for the first time. The only allusion to the work of others is a reference to a paper by Brown, entitled, "The Rise of Temperature in the Field Coils of Dynamos" (*Proceeding of the Institution of Electrical Engineers*, Vol. XXX. (1901), p 1,159). It is far from our intention to depreciate the present very careful, painstaking and interesting investigation, but in view of information which had already been published several years ago, and which leads to substantially the same conclusions as have been arrived at by this later investigation, we do not see the necessity for having delayed the recommendations concerning the standardization of the temperature rise, pending the completion of these tests.

As stated in the report, the permissible temperature of field spools is dependent mainly upon the properties of the cotton coverings of the copper conductors. The tests regarding this point led to the conclusion that a temperature of 125° C. could not be exceeded without the risk of impairing the insulation of these cotton coverings, and that this limit was only safe in cases where the moisture had been completely and finally expelled from the cotton coverings; for when even slight traces of moisture are present, a serious leakage may occur, since the ohmic insulation resistance of many *dry* insulations is halved for, say, every 7° C. increase in temperature Hence with 80° to 100° C. increase in temperature, the ohmic insulation resistance is but a small fraction of the value at, say, 30° C. If even a slight trace of moisture is present, the insulation resistance is again reduced many fold. It is pointed out in the report that the weight of the cotton covering often comprises some 5 per cent. to 7 per cent. of moisture, which may be expelled by heating.

Everything mentioned up to this stage has already been pointed out years ago by others. One point on which we do not remember to have seen any experimental results, relates to a quantitative investigation of the rate at which the insulation resistance of a cotton covering varies with the percentage of contained moisture. The results could be expressed in terms of the percentage reduction in insulation resistance for 1 per cent. increase in moisture in the cotton covering. We suggest that this would be a useful and original subject for investigation, and we believe that the nature of the results would be such as to lead to the far more general use of vacuum ovens in the electrical industry.

Vacuum ovens are not even so much as mentioned in the report, although we find occasional reference to the set-backs in the work due to a tardy discovery that the omission of sufficient preliminary "stoving" necessitated a repetition of tests. The report also takes due note of the fact that cotton coverings from which moisture has been carefully expelled rapidly take up from the surrounding atmosphere some 4 per cent. to 7 per cent. of their weight in moisture. This should lead to a careful consideration of the question not only of impregnating the insulations with some suitable varnish, but also of filling up all interstices between conductors, with some suitable insulating compound. This may be done by thoroughly exhausting the air from the coil in a vacuum chamber, and then filling it in solid under pressure. Not only will moisture be thus effectively excluded, but, by the right choice of impregnating materials, the emissivity of the coil may be greatly improved. The report describes a field spool which appears to have been treated in substantially this manner, in which a decrease of over 25 per cent. in the temperature rise of the coil was thus attained. There are on the market several materials for such a purpose, and it would be of interest to have comparative tests of the results obtained by impregnating otherwise identical coils with these various materials.

A large part of the report is devoted to a description of an investigation in which, for nine different designs of field coils supplied by several manufacturers of electrical machinery, observations were made of the percentage by which the maximum temperature in the interior of the coil, as determined by thermo-junctions, exceeded the temperature as obtained by resistance measurements. The excess was found to amount to over 15 per cent. in a good many instances.

At this point we must revert to the subject of cotton coverings, and call attention to the results of Dettmar's[1] investigations, completed in 1900, on the effect of temperature on the cotton coverings of copper wires. Dettmar made a series of deterioration tests at 95° C., withdrawing and testing numbers of samples at pre-arranged intervals. After 100 hours, no change in the cotton covering was observable. After 500 hours, a slight discoloration was apparent, and a decrease in the flexibility could be observed in the cotton covering on bending the wire sharply. After 1,000 hours, the discoloration and the decrease in flexibility were more pronounced. Dettmar concluded that while 95° C., or even more, may be permissible for stationary windings, it should be regarded as the extreme upper limit for windings subject to vibration, such as occur in the coils on rotating armatures. Similar tests at 115° C., also for 100, 500 and 1,000 hours, resulted in such pronounced deterioration as to lead to the conclusion that so high a temperature should not be permitted. Another group of tests with paper insulated wires showed that in that case a temperature of 115° C. could be permitted with perfect safety.

In view of Dettmar's tests, which are accepted as authoritative by the German Association of Electrical Engineers, it would hardly be conservative to assign to the highest temperature, to which there should be any probability that the cotton coverings of the turns of the field magnet windings would be exposed, any value higher than 100° C. Taking this figure, then the highest value of the temperature, as determined by measurements of the resistance of the coils, should not be permitted to exceed 87° C. Electrical machinery is often required to operate in places where the surrounding temperature permanently or occasionally reaches 35° C. Hence there remains 52° C. as the highest permissible temperature increase as determined by measurement of the increase of resistance, if we wish by means of a general rule to insure that the quality of the cotton coverings shall not be impaired by the temperature to which they are exposed. This final deduction is our own, and it may be useful to go on with, pending the issue of an authoritative recommendation from the Standardizing Committee.

As to thermometric measurement of the temperature of field coils, we thoroughly agree with the position taken up in the report, that this method should make way for the more exact method by means of resistance measurement. One finds, however, from the National Physical Laboratory tests on these 9 coils, an average value for the temperature, as thermometrically determined, of less than 65 per cent. of the value determined by measurement of the electrical resistance, and hence, in cases where thermometric measurements are employed, a temperature rise of more than 35° C. above the surrounding air could not consistently be permitted.

It will be interesting to see how it is proposed to square these facts with the intimation contained in the interim report of the sub-committee, to the effect that the temperature limits ultimately to be recommended are likely to be more liberal than those laid down by either the American or German Electrical Standardization Committees. It has always seemed to us that apparatus of continental manufacture is rated decidedly too high as regards the temperature rise permitted, although we admit that the high output obtained per unit of weight is in great part legitimately obtained by the excellence of the designs as regards ventilation.

1. "Ueber die Nothwendigkeit der Aufstellung von Normen fur die Bestimmung und Angabe von Leistung, Erwarmung und Wirkungsgrad elektrischer Maschinen."—Georg Dettmar, *Elektrotech. Zeitschr.* Vol, xxi., August 23d, 1900, p. 727.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

We are indebted to Mr. William H. Bristol, President of the Bristol Company, of Waterbury, Conn., for a copy (No. 28) of its latest revised edition of its thermometer catalogue. In this edition the Company has classified its thermometers according to the principles upon which they depend for their operation. The lists of the different classes of thermometers, which cover all temperature ranges up to 1,200° F., have been carefully tabulated with the idea of making it convenient for a prospective user of one of the instruments to easily select the type or specimen best adapted to meet his special needs. Each instrument is designated by an individual catalogue number and by a code word.

We are informed that a gas works, to be operated on municipal account, has been arranged for by the authorities of Cherokee, Ia., and that the contract for the construction of same has been awarded to Mr. W. H. Harrison, Jr., of Toledo, O. Our informant adds the further mystifying news that the contract price for the plant complete is $26,500, which sum includes the cost of placing 9 miles of street mains. Very cheap that price seems to one whose home is in this vicinity.

Evidently Engineer-in-Chief Allen, of the Mutual Gas Light Company, of this city, has some important extension work on hand, if one may judge from the advertisement that appears this week in our sales columns respecting second-hand apparatus that is offered for sale. If we mistake not, the Company is about to construct an additional water gas plant, up to a per diem output of 12,000,000 cubic feet.

The receivers of the Framingham (Mass.) Gas, Fuel and Power Company have obtained an order from the Superior Court appointing the 7th prox. as the date on which the report of the receivers and the findings thereof shall be finally considered and allowed and the prayers thereon granted. The Court will hold session in Boston at 10 A.M. of the date mentioned.

At the last meeting of the Directors of the Berlin (Wis.) Gas Company Mr. Thomas B. Wood, of Cincinnati, O., who took an active part in the construction of the works, has been appointed resident manager of the Company. He is an active, up-to-date gas engineer and business man.

Mr. W. G. Wheat, of Springfield, Mass., has been chosen a Director in the Springfield Gas Light Company, vice Mr. P. F. Thompson, of New York, resigned.

THE Victoria (B. C.) Electric Railway and Lighting Company hsa secured control of the Victoria Gas Company. It is likely that Mr. F. H. Hewling will be retained as Manager.

THE ordinance of the Fort Madison (Ia.) Gas Light Company has been extended for a period of 25 years by the City Council. The voters have been notified that a special election for their acceptance or rejection of the ordinance will be held on the 5th prox.

ON October 1st the gas rate at San Bernardino, Cal., will be put at $1.25 per 1,000 cubic feet, with a discount of 25 cents for prompt payment.

THE Oregon and Washington Power Company has transferred all of its rights of way, water rights and interest in the power plant and appliances located on the Walla Walla river to the Northwestern Gas and Electric Company.

AT the annual meeting of the shareholders in the New York Mutual Gas Light Company no change was made in the executive management.

IT is understood that Mr. John D. Brooder, of Kane, Pa., and Mr. P. J. Hass, of Omaha, Kas., will erect a gas plant in York, Neb.

THE Board of Gas and Electric Light Commissioners, of Massachusetts, has authorized the Cambridge Gas Light Company to issue 1,200 additional shares of stock, the shares to be sold at a minimum price of $200 each. The proceeds from 500 shares will be used to take up floating indebtedness and the proceeds from the remaining 700 shares will be used to pay for additional plant, etc.

A CORRESPONDENT in Hartford, Conn., writing under date of the 15th inst., incloses the following: "The Committee on Incorporations last week submitted to the lower branch of the Legislature a favorable report on the incorporation of the North Haven (Conn.) Gas and Electric Light Company. The incorporators are Robert O. Eaton, Hubert F. Potter and R. J. Woodruff, and the Company is authorized to issue capital stock from $5,000 to $500,000, and to issue bonds not to exceed the amount of the capital stock. The petition bears the indorsement of Mr. Charles H. Nettleton, President of the New Haven Gas Light Company. The North Haven Company under the charter is empowered to sell or lease or consolidate with any other Company, providing the New Haven Gas Company does not extend its mains into North Haven prior to July 1, 1906."

AT the annual meeting of the Denver (Col.) Gas and Electric Company the officers elected were: Directors, Emerson McMillin, Henry C. James, Henry L. Doherty, Frank W. Frueauff, James B. Grant, A. B. Hughes, Henry T Rogers, E. W. Rollins, Irvin Butterworth, R. L. Sullivan, Charles A. Frueauff, W. J. Barker and Philip Cross; President, Henry L. Doherty; Vice-President and General Manager, Frank W. Frueauff; Secretary, R. B. Sullivan.

ACCORDING to the Rome (N. Y.) *Sentinel*, Mr. A. B. Morton, who has been for some time past in the employ of the Rome Gas, Electric Light and Power Company, has gone from Rome to Webb City, Mo., where he is to act as Superintendent of the new natural gas plant that is to furnish gas to the residents of Webb City and Cartersville. The plant is owned by the Natural Gas, Electric Light and Power Company, which corporation also controls the Rome plant. Mr. Morton during his residence in Rome has made many friends, who, while they are sorry over his going from them, wish him every possible success in his new field.

MR. JOHN B. ELMENDORF, as President of the Fishkill and Matteawan (N. Y.) Gas Company, has petitioned the President and Trustees of the village of Matteawan for "the right and franchise to manufacture, sell and supply electricity for purpose of light, heat and power to the citizens and inhabitants of said village of Matteawan, according to its present prescribed limits or future extensions and additions, for and during the term of 50 years." It is further agreed that the Company will be in readiness to supply current on or before the expiration of 2 years from the date of the franchise, and that in no case shall the charge for current exceed 20 cents per 1,000 watts.

ACCORDING to the public prints an order was issued this month by the Navy Department informing the officers of the navy and marine corps who live in quarters in the various navy yards that in future they will have to pay for the gas, water, electricity and heat that they use in their homes. This order was issued as the result of an inquiry made some weeks ago by an officer of the marine corps, who felt himself unfairly treated in being charged for gas, etc., when naval officers occupying government quarters in the same reservation had such service free of cost. This led to much correspondence, and the decision by the head of the navy department and the comptroller was that there should be a charge for such items in the future, naval officers and officers of the marine corps faring alike.

AT a special meeting of the stockholders of the Fall River (Mass.) Electric Light Company it was voted to petition the Board of Gas and Electric Light Commissioners for permission to increase the capital stock from $350,000 to $600,000.

MR. B. L. BLANCHARD, writing to us from St. Louis, Mo., under date of the 12th inst. incloses the following: "At a meeting of the Executive Council of the St. Louis Manufacturers' Association, held the 11th inst., it was voted not to indorse the franchise sought by promoters of the project to pipe natural gas from the Kansas fields to St. Louis. The promoters were given a hearing some evenings before, at a meeting of the Association held in the premises of the Mercantile Club, at which time the 'chief promoter,' Mr. J. H. Arnold, of Kansas City, pleaded for the Association's support of the bill granting him and his associates the right to place distributing mains in the city's streets. In the ending of the debate and pleas the following resolution was adopted:

"*Resolved*, By the Executive Council of the St. Louis Manufacturers' Association, That considering the fact that the ordinance granting the right to lay pipes in St. Louis to parties representing the natural gas fields of Kansas and Indian Territory does not provide a good and sufficient bond for the faithful carrying out of the proffered franchise, this body does not feel it would be doing the manufacturers and citizens of St. Louis justice by indorsing this ordinance and using its influence to secure its passage. The ordinance is too indefinite in its provisions to insure the fulfilling of the obligations of the franchise by the gentlemen seeking same."

THE Automatic Gas Appliance Company, of Boston, Mass., has been incorporated by Messrs. Fred A. Ewell, George F. Ramponi and associates. It is capitalized in $50,000.

MR. JOHN H. KEPPELMAN, Superintendent of the Consumers Gas Company of Reading, Pa., is so satisfied with the results of the last year's working, that he is again at the Directors with the suggestion that another cut in the selling rate be made as soon as the knife can be ground. "Kepp." is a great believer in "mutualization."

AT the annual meeting of the Detroit City (Mich.) Gas Company, the Directors elected were: Thomas H Hubbard, M. W. O'Brien, A. C. Angell, Cameron Currie, A. P. Lathrop, Eugene T. Lynch, John Byrne, J. C. Donnelly, E. McMillin, George Crocker, D. M. Ferry, F. S. Smith and George H. Russell. A dividend of 3 per cent. was declared.

CONSTRUCTION work on the new gas plant for Fredericksburg, Va., which is under municipal control, has been commenced. Mr. Erank P. Stearns is doing the buildings proper, the ironwork was let to the Stacey Manufacturing Company, and the Baltimore Retort and Firebrick Company was awarded the bench construction. Supervising Engineer Egner is bold enough to say that the work will be completed by November 1st. We understand that Mr. B. F. Bullock will be Mr. Egner's man in the field.

THE following tale of how bubbles show but little, is given for what it may teach—it came to us from Elgin, Ills, under recent date: "While John Gyllestrone, of Coleman, was sitting on a tree branch overhanging the river, he noticed a disturbance in the water about 20 feet from the shore, followed by a succession of large bubbles that burst and sent the water flying in all directions. Puzzled by the strange phenomenon he summoned a party, who crowded into a boat and sailed or 'pulled' to the troublous point. The odor of gas was scented, and one of the party with a handy match touched off a bubble that brought about an explosion that moved the boat. Then they knew all. They had discovered a natural gas well. At this time or shortly thereafter, an employee of the Elgin American Gas Company reached the center of disturbance and cooled the ardor of the discoverers by announcing that the Company's gas main, which runs under the 'river' between St. Charles and Elgin, had parted, hence the natural gas well. It took about 6 working hours to repair the break."

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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OHIO GAS LIGHT ASSOCIATION.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:
New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, MAY 22, 1905.

The Market for Gas Securities.

The gas share market during the present week reflected the conditions of last week. There is no change in the situation; there is virtually no change in the quotations. Consolidated closed at 187 to 188 to day (Friday), and the professionals are predicting lower prices for it. Likely they are wrong. The market for local gas bonds, however, is steady, in fact, strong. The "bills" are in due process of signing. Mayor McClellan seems to have won the last trick over the Albany players, for in his present frame of mind we imagine that if he had a chance at the State commission measure he would not hesitate to consent to it officially.

Brooklyn Union is as it was a week ago, but the "shorts" seemingly fail to take liberties with it. Peoples, of Chicago, looks tempting at under par, and we do not think the legislation recently enacted bodes it any great harm. Washington (D.C.) gas is a trifle steadier, and the nominal figure for Baltimore is 82½ to 83½. The American Gas Company, of Philadelphia, has declared its regular semi-annual dividend of 3 per cent. Cincinnati holds its own in good shape, as does Laclede preferred.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY

MAY 22.

☞All communications will receive particular attention.

☞The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	187	188
Central Union, Bonds, 5's.	3,000,000	1,000	108½	110
Equitable Bonds, 6's	1,000,000	1,000	..	103
" 1st Con. 5's	2,300,000	1,000	118	120
Mutual	3,500,000	100	300	320
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co..				
Bonds, 5's	11,000,000	1,000	112	113½
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	.
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	.	.
Northern Union, Bonds, 5's.	1,250,000	1,000	104	106
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106½	108½
Standard	5,000,000	100	125	130
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299.650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	125	125
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	¼	⅜
" ncome Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	6	7
" " Bonds, 5's	5,250,000	1,000	66	68½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	107¼	107½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	97½	99
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89¼
Preferred	3,026,500	100	107½	109
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	82½	83½
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	89½	92
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,325,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	104½	105½
" Bonds, 5's	10,500,000	..	107	108
Indianapolis	2,000,000	..	70	75
" Bonds, 6's	2,650,000	..	106½	108
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	
Preferred	2,500,000	100	100	105
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	99¼	99½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	.	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	58½	58¾
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	94	96
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	.
Washington, D. C	2,600,000	20	307½	310
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600.000	50	220	..

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(*Continued on page 816.*)

DIVIDEND NOTICE.

OFFICE OF THE AMERICAN GAS COMPANY,
222 S. THIRD ST., Philadelphia, Pa., May 17, 1905.

The Board of Directors of The American Gas Company has this day declared a semi-annual dividend of 3 per cent., or $3 per share, on the capital stock of the Company, payable on and after June 1, 1905. Checks will be mailed.

1563-1 WALTER GODLEY, Treasurer.

NOTICE!

PLEASE read the advertisement of the Empire Gas Improvement and Construction Company, on page 821. This Company employs only high-priced and quick-working mechanics, and all its work is guaranteed to be strictly first class, and will be finished at time specified.

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(*Concluded from page* 815.)

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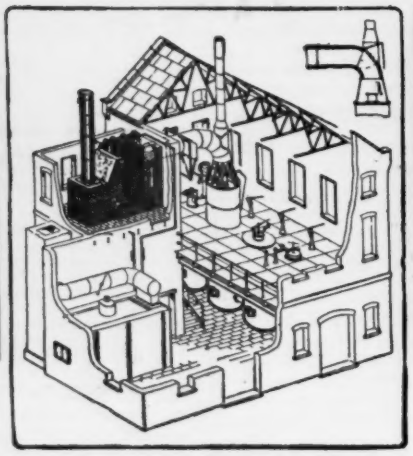

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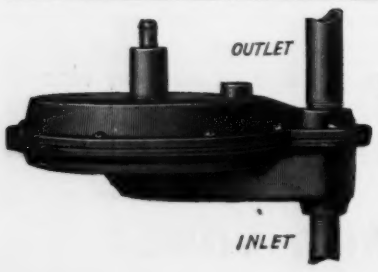

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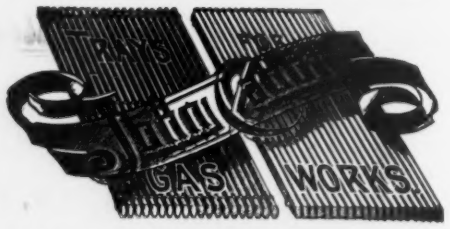

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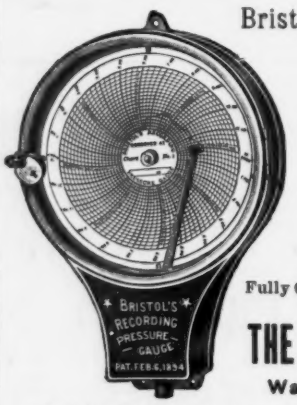

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You can buy burners
that cost less than

BRAY BURNERS,

But all you save on the first cost will be lost a hundred times over in the increased number of complaints and dissatisfied consumers.

DON'T PUT GOOD GAS IN THE HOLDER AND SPOIL IT AT THE BURNER.

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Have been used by the largest Gas Companies for over forty years, because

THE PROGRESSIVE GAS MAN ONLY WANTS THE BEST.

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TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

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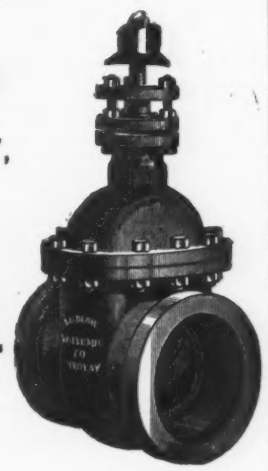

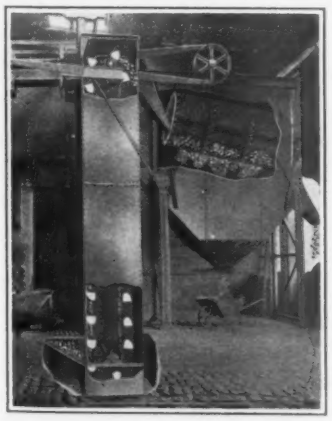

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installed for the Mutual Gas Light Co., New York City, for

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"We claim intelligent application of well-known appliances in novel and original ways to solve problems."

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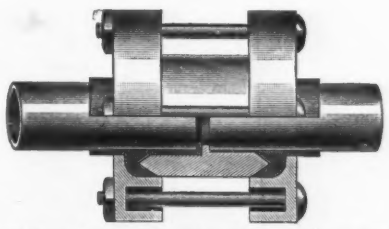
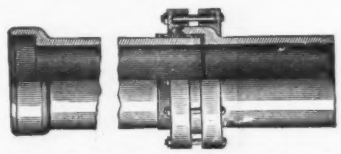
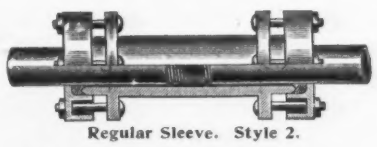
Patentee and Manufacturer of Specialties for Oil and Gas Lines.



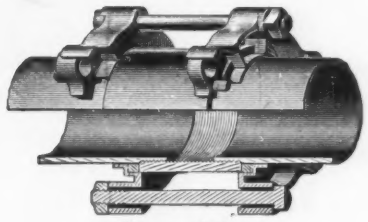
Insulating Coupling for Wrought Iron Pipe. Style 5.



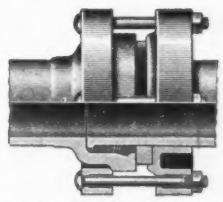
Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.



Regular Sleeve. Style 2.



Clamp. Style 4.



Clamps for Cast Iron Pipe. Style 4½.

Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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EMPIRE GAS IMPROVEMENT AND CONSTRUCTION CO.

This Company has purchased the patents and goodwill in the business hitherto carried on and owned by *A. M. Sutherland.* It is now ready to contract for the erection and installation of

ENTIRE GAS WORKS,

or any separate portion of the same, such as **Gasholders, Coal Gas Benches, Lowe-Sutherland** double-superheater **Water Gas Sets,** Scrubbers, Condensers, Exhausters, Purifying Boxes, Street Governors, Street Mains and Main Laying.

The high character of the work done by A. M. Sutherland during the past 15 years will be strictly adhered to and all work is warranted.

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Lloyd's Rubber Lute

From January 1, 1905, to date, has been
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10,500,000

Cubic Feet Daily Capacity.

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COMBINATION MACHINE.

C—1002.

While a tapper specially designed for pressure tapping can also be used for open tapping, if you have to depend upon one machine for both you might find it economical to use a cheaper machine specially designed for the double purpose.

The Mueller Combination Tapping Machine is medium priced, has a detachable gas cylinder with the aid of which pressure tapping is done, and which can be quickly removed for making dry taps. It serves the two-fold purpose with economy.

Mueller Tapping Machines are made in seven styles and for all kinds of service and open tapping. The machine illustrated makes taps under pressure from ¾ to 2-inch, and open taps up to 3-inch.

Each machine is carefully inspected and assembled, is given a working test as near like actual service use as possible, bears the Mueller trade mark, and is *unconditionally guaranteed.*

We also make meter connections and ground key work for gas works use. Catalogues upon application.

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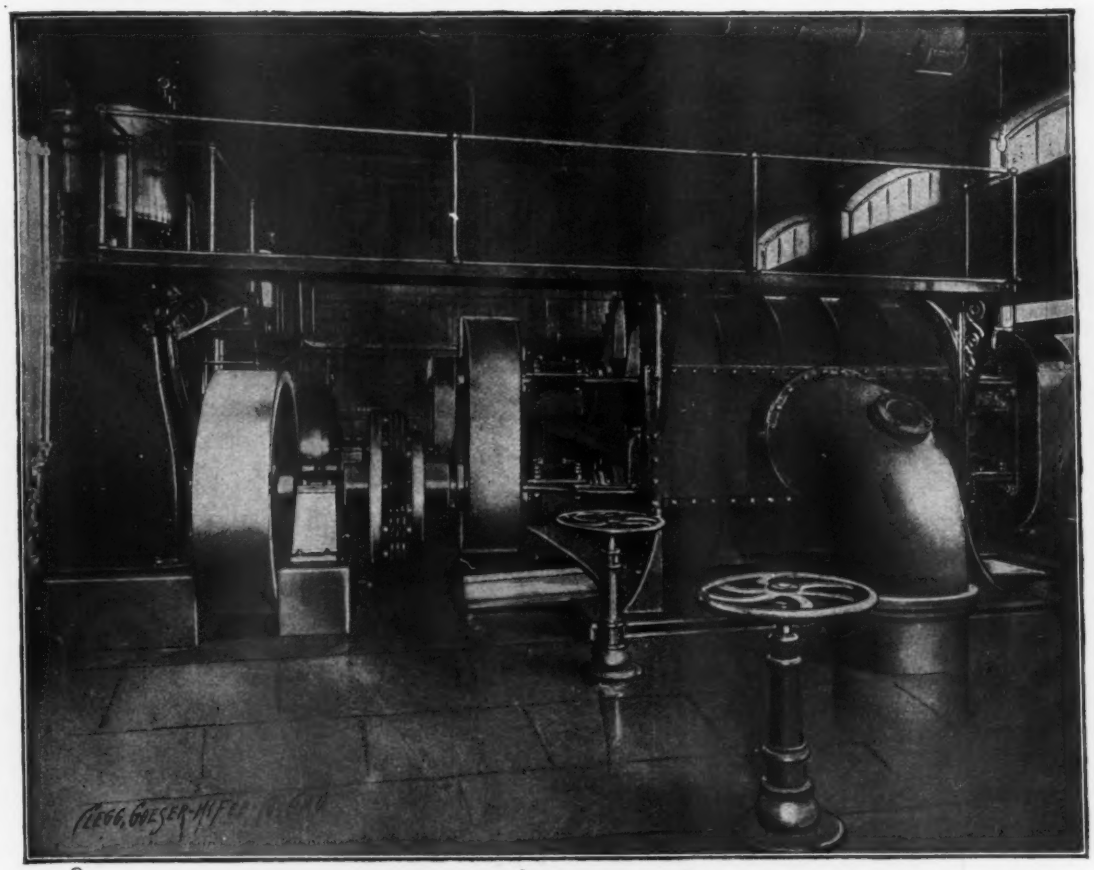

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Installation showing our latest improved machines, with flexible rope coupling, for large units.

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TELEPHONE, 5534 BROAD.

FRANK D. MOSES,

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Estimates Furnished on any kind of Work in Connection with Gas or Water Plants.
SPECIAL ATTENTION GIVEN TO THE REMODELLING AND EXTENDING OF THE PROPERTIES OF WORKS NOT UP-TO-DATE.
CORRESPONDENCE SOLICITED.

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DONALDSON IRON COMPANY. EMAUS, PA.

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FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

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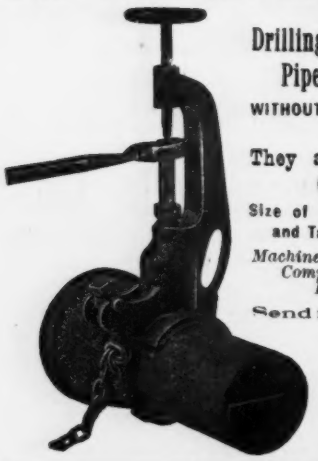

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"THE MINER"

Globe Street and Boulevard Lamps.

Cheapest and Best

THOUSANDS IN USE WITH INCANDESCENT BURNERS.

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We make Mast and Gaff Iron Fittings for gas companies, coal dealers and manufacturers. Made in two sizes and kept in stock, ready for prompt delivery.

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Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

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Plans prepared and Estimates furnished at short notice.

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Established 1856. Works at Phillipsburgh, N. J.

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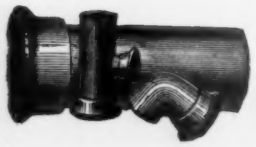

CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

CHARLES MILLAR & SON CO., Selling Agents, Utica, N.Y.

Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.

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Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers' and Tinners' Goods.

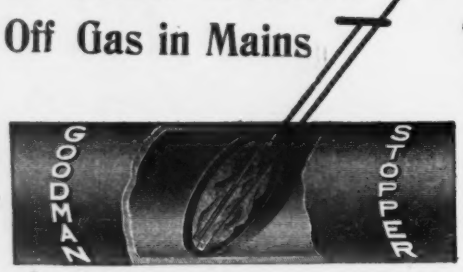
CAST IRON PIPE and SPECIALS FOR WATER AND GAS.

Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

SAFETY GAS MAIN STOPPER COMPANY,

For Shutting Off Gas in Mains

Any size gas main can be shut off in 30 seconds. : : :



Temporarily during alterations and repairs. : : : :

STOPPERS SENT ON TRIAL.

Address: SAFETY GAS MAIN STOPPER CO., 1668 Park Ave., New York City.

This is No. 2.

Height, 36 inches.
Diameter, 12 "
Shipping weight, 90 lbs.
Net weight, 50 lbs.
The products of combustion are entirely separate from the water.
Entire water surfaces are tinned.

Price, $35.00.

HOT WATER

FOR BATHROOM AND KITCHEN

is most easily, quickly and economically supplied by a

Humphrey Crescent Instantaneous Water Heater.

Prices range from $20 to $45.
Every Heater GUARANTEED.

Set a heater for every gas consumer. You will please them and increase sale of gas at the same time.

Send to-day for catalogue and discounts to

HUMPHREY CO.,

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The only manufacturers in the World of a COMPLETE LINE OF INSTANTANEOUS WATER HEATERS.

GAS ANALYST'S MANUAL,

By JAQUES ABADY, M. Inst. Mech. E.

(Incorporating F. W. Hartley's "Gas Analyst's Manual" and "Gas Measurement.")

Ninety-three Illustrations and Nine Folding Plates. Bound in Handsome Half Leather. Price, $6.50.

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AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

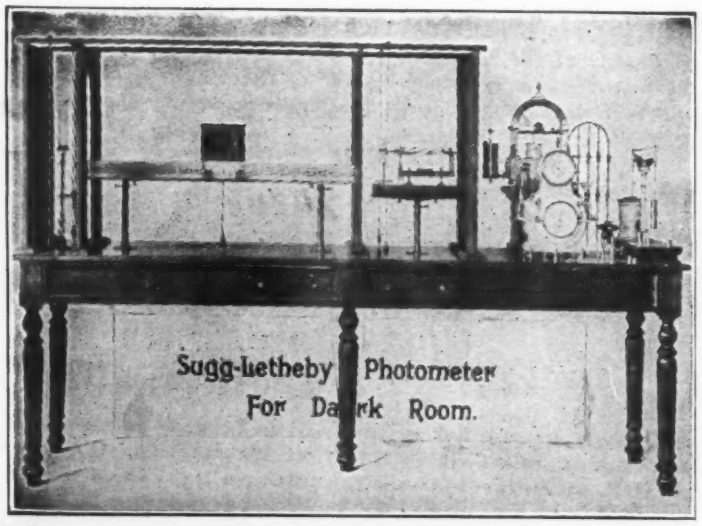
JUNE, 1905.

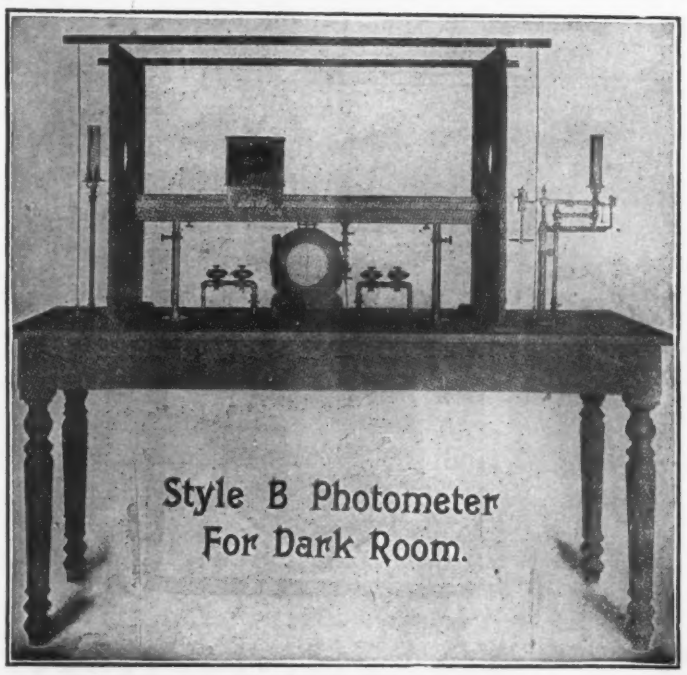
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Thu.	1	7.50 PM	3.30 AM
Fri.	2	7.50 NM	3.30
Sat.	3	7.50	3.30
Sun.	4	7.50	3.30
Mon.	5	7.50	3.30
Tue.	6	7.50	3.30
Wed.	7	10.00	3.30
Thu.	8	10.40	3.30
Fri.	9	11.20	3.30
Sat.	10	11 50 FQ	3.30
Sun	11	12.30 AM	3.30
Mon.	12	1.00	3.30
Tue.	13	1.40	3.30
Wed.	14	2.20	3.30
Thu.	15	No L.	No L.
Fri.	16	No L. FM	No L.
Sat.	17	No L.	No L.
Sun.	18	8.00 PM	9.50 PM
Mon.	19	8.00	10.30
Tue.	20	8.00	11.10
Wed.	21	8.00	11.50
Thu.	22	8.00	12.20 AM
Fri.	23	8.00	12.50
Sat.	24	8.00 LQ	1.20
Sun.	25	8.00	1.50
Mon.	26	8.00	2.20
Tue.	27	8.00	2.50
Wed.	28	8.00	3.20
Thu.	29	8.00	3.30
Fri.	30	8.00	3.30

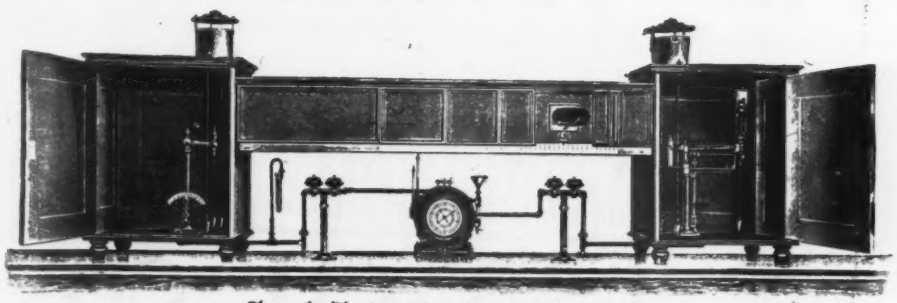
TOTAL HOURS DURING 1905.

By Table No. 1.

	Hrs.Min.
January	240.50
February	192.20
March	207.00
April	175.10
May	161.00
June	139.50
July	149.00
August	161.50
September	173.00
October	205.00
November	211.00
December	229.00
Total, yr.	2245.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

JUNE, 1905.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light	Extinguish.
		P. M.	A.M.
Thu.	1	7.15	3.15
Fri.	2	7.15	3.15
Sat.	3	7.15	3.15
Sun.	4	7.25	3.15
Mon.	5	7.25	3.15
Tue.	6	7.25	3.15
Wed.	7	7.25	3.15
Thu.	8	7.25	3.15
Fri.	9	7.25	3.15
Sat.	10	7.25	3.15
Sun.	11	7.25	3.15
Mon.	12	7.25	3.15
Tue.	13	7.25	3.15
Wed.	14	7.25	3.15
Thu.	15	7.25	3.15
Fri.	16	7.25	3.15
Sat.	17	7.25	3.15
Sun.	18	7.30	3.15
Mon.	19	7.30	3.15
Tue.	20	7.30	3.15
Wed.	21	7.30	3.15
Thu.	22	7.30	3.15
Fri.	23	7.30	3.15
Sat.	24	7.30	3.15
Sun.	25	7.30	3.15
Mon.	26	7.30	3.15
Tue.	27	7.30	3.15
Wed.	28	7.30	3.15
Thu.	29	7.30	3.15
Fri.	30	7.30	3.15

TOTAL HOURS DURING 1905.

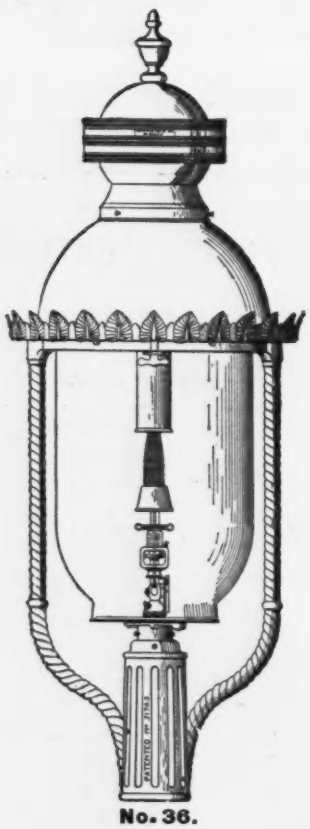
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 9 Libert Street. BOSTON. 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

AN underlying principle in business is to show an increase each year---to grow. The astute dealer not only seeks to retain this year's customers, but to attract new trade next year.

The formula is simple---

THIS SHIELD IS THE WELSBACH TRADE MARK.

IT IS A GUARANTEE AND A PROTECTION.

Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

And your profit isn't merely dollars and cents.

WELSBACH CO.,

Broad and Arch Sts., PHILADELPHIA.

THE UNITED GAS IMPROVEMENT COMPANY

For the Year Ending December 31st, 1904, has been Awarded Contracts for 45 Sets of

Standard Double-Superheater Lowe Water Gas Apparatus.

PARTIAL LIST OF PLACES:

Harrisburg, Pa.	**New York City** (14th contract).	**Lynn, Mass.** (5th contract).
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Reading, Pa.	**Watertown, N. Y.**	**Battle Creek, Mich.**
Augusta, Me.	**Tampa, Fla.** (3d contract).	**Mechanicsburg, Pa.**
Bangor, Pa.	**Westchester, N. Y.** (3d contract).	**Excelsior Springs, Mo.**
Woonsocket, R. I. (2d contract).	**Bridgeport, Conn.** (2d contract.)	**Bristol, Conn.**
Brooklyn, N. Y. (4th contract).	**St. Paul, Minn.** (2d contract).	**Jersey Shore, Pa.**
Cincinnati, O. (2d contract).	**Springfield, Mass.** (2d contract).	**Vicksburg, Miss.**
Scranton, Pa. (3d contract).		

TOTAL SETS, 1904, ... 45
TOTAL DAILY CAPACITY, 1904, ... 56,325,000 cubic feet.
TOTAL SETS TO DATE, ... 553
TOTAL DAILY CAPACITY, ... 419,180,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

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FLEMMING GENERATOR GAS FURNACE

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NATIONAL PYROGRANIT COMPANY,

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AND

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Established 1846.

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Manhattan Fire Brick and Enameled Clay Retort Works.

Works at Weber, on the Raritan River, Middlesex County, N. J.

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Modern Coal Gas Plants,

With either Horizontal or Inclined Retorts, Half-Depth and Full-Depth Recuperative Furnaces, Adam Weber Patents.

MODERN BENCH IRONWORK.

Linings for Water Gas Apparatus, High Grade Fire Brick of All Descriptions, Ground Fire Clay, Ground Fire Brick in Bulk or Barrels.

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Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

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Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. BLOOMINGTON, INDIANA.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, BLOOMINGTON, IND.

For orders East of Buffalo, N. Y., or Pittsburg, Pa., freight will be paid to these points.

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Consulting Engineers.

Builders of UP-TO-DATE Machinery and Appliances for Coal and Water Gas Plants. :: :: :: :: ::

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SPECIFICATIONS
AND ESTIMATES
PREPARED.

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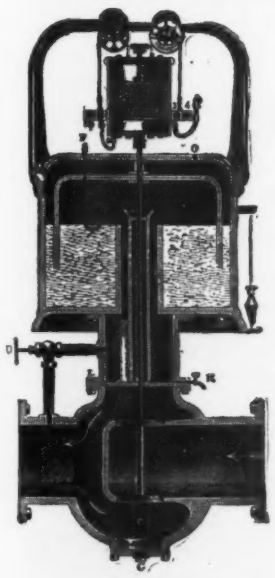

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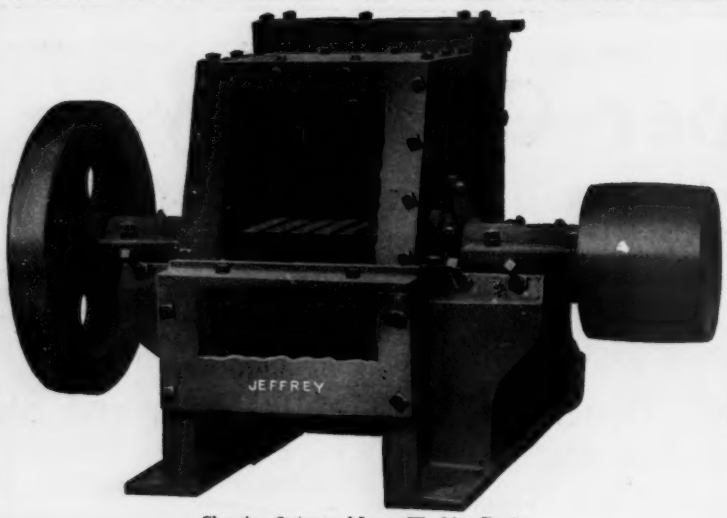

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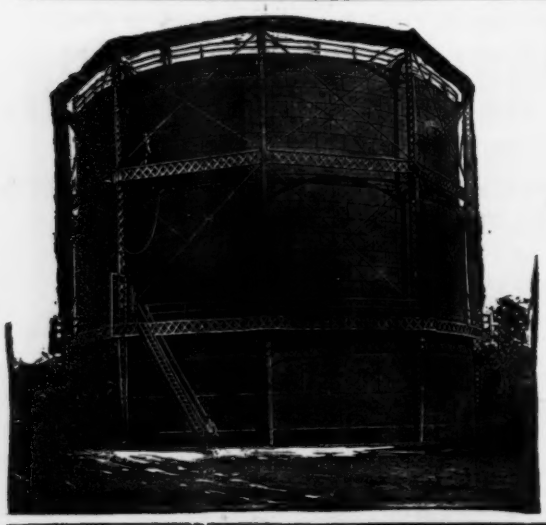

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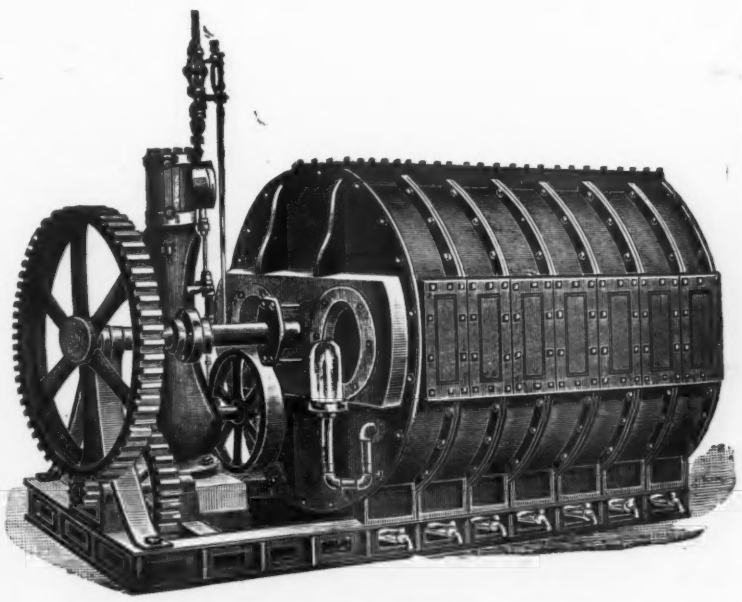

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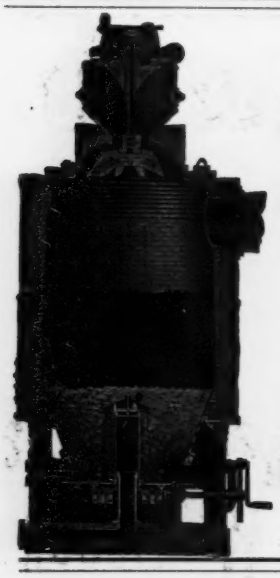

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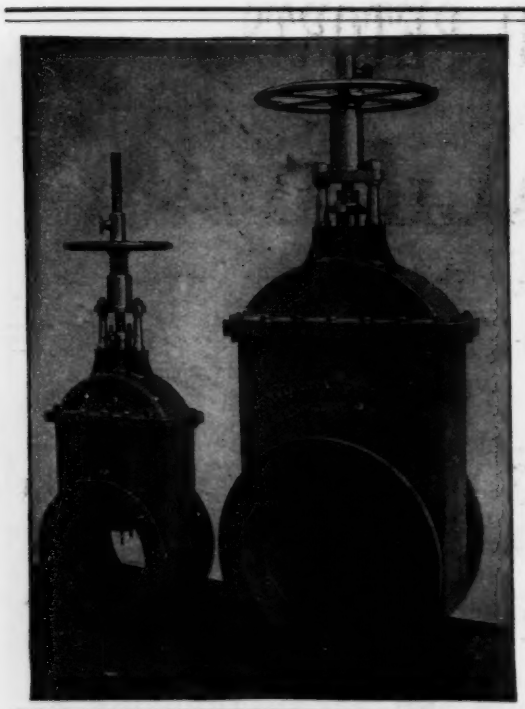

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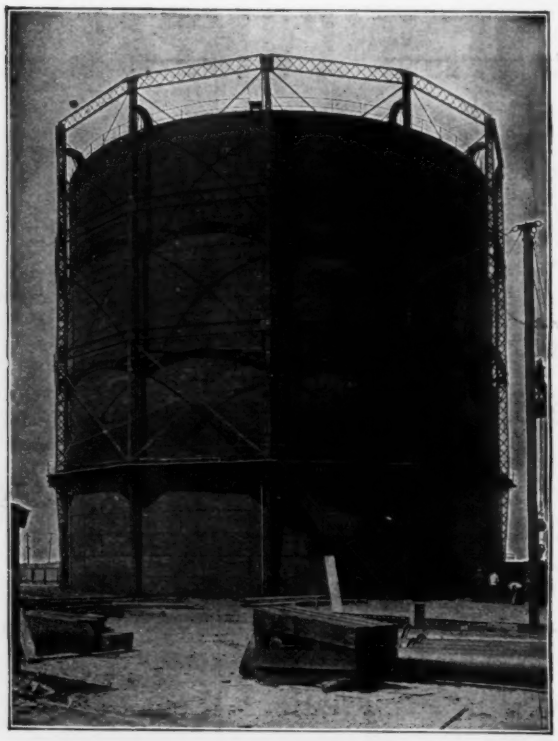

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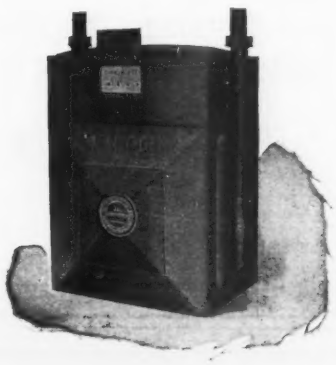

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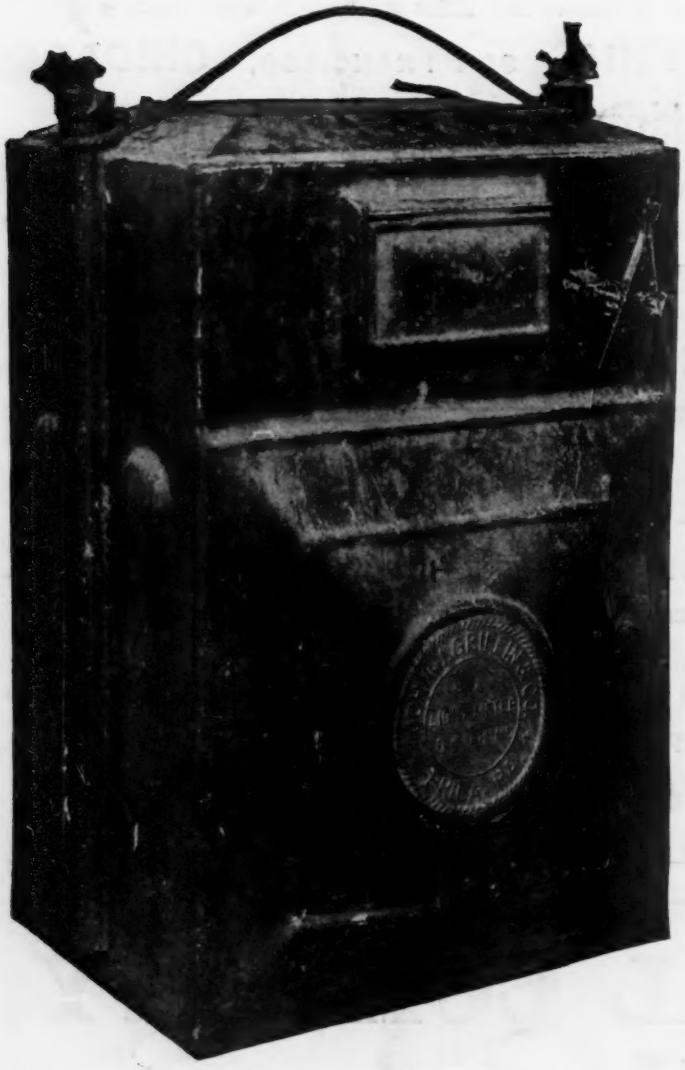

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